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Goodman International Limited

Oakdale Concept Plan

Water Balance Options Report - Part 1

December 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Abbreviations

DEC	Department of Environment and Conservation
EP	Equivalent Persons
ET	Equivalent Tenancy
IWM	Integrated Water Management
MG	Goodman International Ltd
STP	Sewerage Treatment Plant
SWC	Sydney Water Corporation
WELS	Water Efficiency Labelling

Glossary

Greywater: Greywater is recycled effluent collected from all streams that flow to the sewer, except the kitchen and toilet/urinal.

Blackwater: Blackwater is recycled effluent collected from all flow to the sewer, including the kitchen and toilet.

Development: The land to be developed by Goodman International Ltd, known as Oakdale, consisting of Lot 1 and Lot 2 DP 120673, Lots 82 and 87 DP 752041, and Lot 1 DP 84390 is called the ‘development’.

1. Introduction

1.1 General

Goodman International is preparing a concept plan for the Oakdale development (herein known as "the site") in accordance with the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979*.

For the purposes of the concept plan, the development site has been divided into the following 'precincts':

» Central Precinct – comprising Lot 2 DP 120673;

» South Precinct – comprising that part of Lot 82 DP 752041 east of Ropes Creek and Lot 87 DP 752041;

» West Precinct – comprising Lot 1 DP 120673 and that part of Lot 82 DP 752041 west of Ropes Creek; and

» East Precinct – comprising Lot 1 DP 843901, which is the site of an existing Austral Bricks quarry and brickmaking plant.

The location of the proposed development site is shown in Figure 1.

In terms of staging, it is likely that the Central Precinct would be developed first, and is therefore referred to in this report as 'Stage 1'. Indicative staging from Stage 1 would likely progress to the South Precinct ('Stage 2'), then the West Precinct ('Stage 3'), and finally the East Precinct ('Stage 4'). It is noted that the existing Austral quarry/brickmaking plant is planned to continue operating in accordance with existing approvals for the foreseeable future, and would only be developed following the cessation of quarrying/brickmaking and rehabilitation of the site.

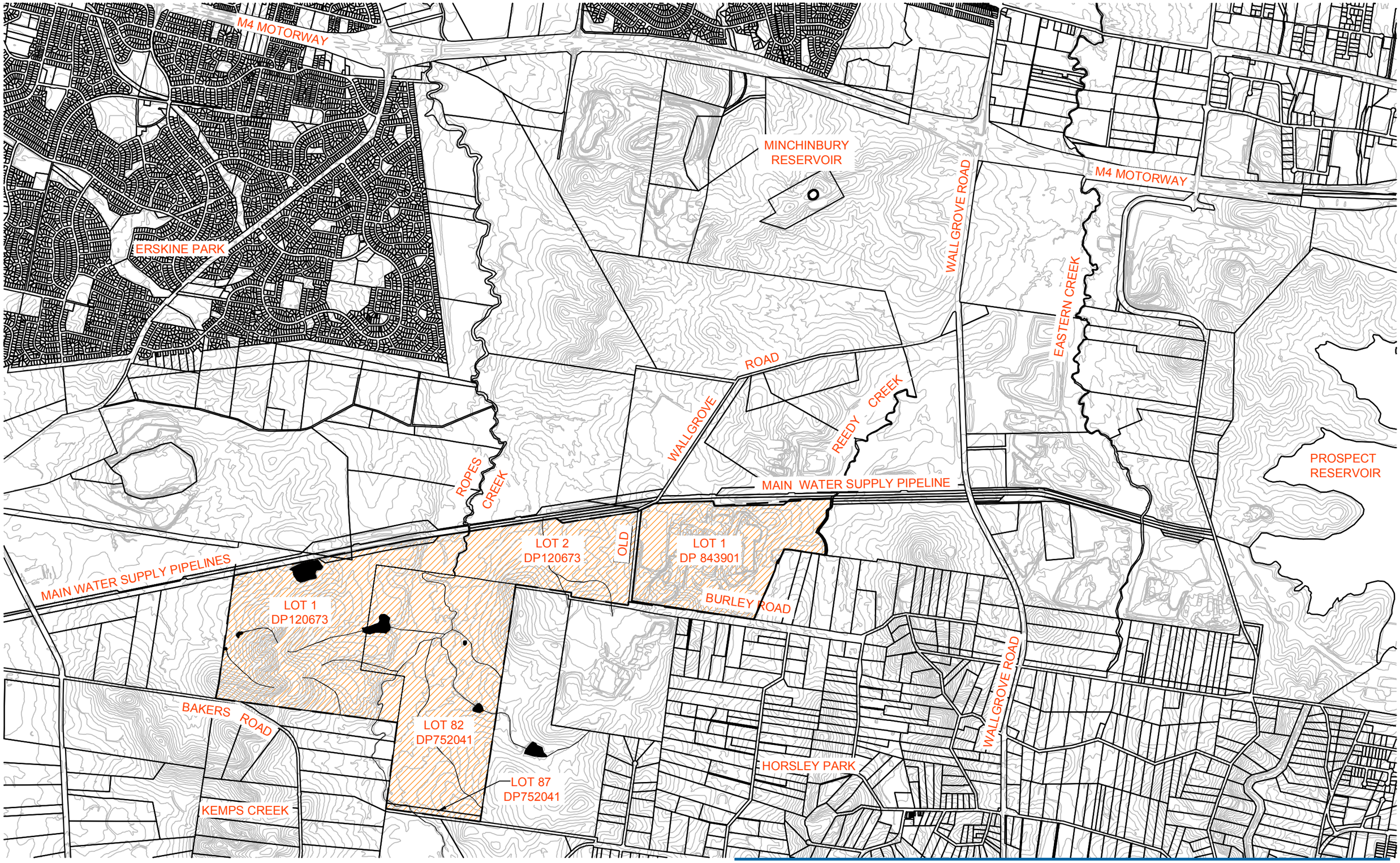
The site forms part of the precinct known as the Western Sydney Employment Hub and is located within two local government areas being:

» Penrith City Council area; and

» Fairfield City Council.

The land will be developed for light industrial land uses such as warehouse and logistics facilities. The total gross land area comprises approximately 421 hectares, of which approximately 270 hectares is assumed to be net developable land (including hardstand and landscaped area). The remainder of the site will be set aside for stormwater drainage infrastructure, roads, riparian zones for watercourses, flood plains and other service requirements.

GHD has been engaged carry out a review of the water balance for the site considering a number of servicing options. It is noted that since the initial water balance modelling was completed a number of additional scenarios and amendments were modelled at the request of Goodman International Ltd. The background and results of the additional modelling is detailed in Appendix A. The main body of the report details the original scenario modelling.



LEGEND

PROPOSED DEVELOPMENT SITE

PROPOSED DEVELOPMENT SITE BOUNDRY

N

0 250 500 750m

SCALE 1:25000 AT ORIGINAL SIZE

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GOODMAN INTERNATIONAL LTD
OAKDALE CONCEPT PLAN

SITE LOCALITY PLAN

job no. | 21-15101
rev no. | B

scale | 1:25000 for A3 date | DECEMBER 2007

Figure 1

Level 6, 20 Smith St Parramatta NSW 1740 Australia PO Box 788 Parramatta NSW 2124 **T** 61 2 8898 8800 **F** 61 2 8898 8810 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Plot Date: 10 December, 2007 - 7:41 PM Cad File No: G:\21\15101\CADD\Drawings\21-15101-WB PART_1_FIG001.dwg

1.2 Objectives

The objectives of Part 1 of the Water Balance Options Report are to investigate differing integrated water management options available for the site for the purpose of selecting a sustainable servicing strategy for the site (to be defined in Part 2 of the Water Balance Report).

It should be noted that the additional modelling scenarios that were carried out and detailed in Appendix A were the scenarios assessed in the multi-criteria analysis (Part 2 of the Water Balance Report).

1.3 Regional Roofwater Harvesting Scheme

GHD understand that it is proposed to harvest roofwater run-off from the Western Sydney Employment Hub (including the proposed development) by collecting roofwater from approximately 800 hectares of industrial warehousing.

The proposed Regional Roofwater Harvesting Scheme includes trunk and collector systems which will convey roofwater via two regional trunk mains, each being a 675 mm diameter main and discharging the collected roofwater to Prospect Reservoir.

The proposed infrastructure shall allow for the transfer of flows from the individual buildings to the regional collector main system. The proposed infrastructure includes necessary roofwater storage to allow for the retention of roofwater prior to pumping into the regional collection system. The retention system is proposed to have a capacity of 440 kL/hectare of roof, to be serviced by pumping systems with a capacity of 5.1 L/second/ hectare of roof. The peak daily flow from the Scheme is expected to capture rainfall of up to 44 mm per day.

A number of scenarios were modelled based on the assumption that roofwater collected from the rooves of the development (up to 44 mm per day) would not be available for utilisation within the developments integrated water management strategy.

In addition, GHD has simulated a number of water balance scenarios to potentially demonstrate the extent to which a portion of the harvestable roofwater may be able to be utilised on site to further maximise potable water savings (and provide a more sustainable servicing option). Permutations and combinations of this concept have been investigated and are outlined in this report.

1.4 Scope of Works

The scope of works for the study was defined as a review of the total water cycle associated with the proposed development site via a water balance (surface stormwater specific issues are considered in a separate report Water Sensitive Urban Design Strategy, (GHD, December 2007). The results of the water balance will determine the water demands (recycled, rainwater and potable) and sewage generation (total, black and greywater) resulting from various stages of the development during various rainfall conditions under differing scenarios.

The water balance model will be used to determine the volume of potential roofwater run-off captured by the development via the implementation of differing rainwater tank volumes (under differing rainfall harvesting mechanisms).

The following basic water balance servicing strategy scenarios were investigated:

» Scenario 1 (SP1)– the availability of black recycled water for all non-potable end uses (toilet flushing, air conditioning cooling, cleaning, truck wash and watering).

The recycling of blackwater assumes that all water that enters the sewer will be available for recycling.

» Scenario 2 (SP2)- the availability of grey recycled water for all non-potable end uses (toilet flushing, air conditioning cooling, cleaning, truck wash and watering).

» Scenario 3 (SP3)- the availability of black recycled water for all non-potable end uses (with the exception of that allocated as serviced by roofwater run-off), together with rainwater exceeding 44mm/day being captured for use for non-potable end uses (as allocated).

Scenario 3 was run for varying combinations of differing non-potable end uses being serviced by roofwater run-off collected in differing sized rainwater tanks.

» Scenario 4 (SP4)- the availability of black recycled water for all non-potable end uses (with the exception of that allocated as serviced by roofwater), together with rainwater being captured for use as required for non-potable end uses (as allocated). All rainwater that is not utilised in the development is assumed to be temporarily stored and transferred to the Regional Roofwater Harvesting Scheme. As a result, Scenario 4 assumed an amended operation of the Regional Roofwater Harvesting Scheme to that currently proposed.

Again, Scenario 4 was run for varying combinations of differing non-potable end uses being serviced by roofwater run-off being collected in differing rainwater tank sizes.

» Scenario 5 (SP5)- Scenario 5 is similar to that proposed in Scenario 3, only greywater is recycled (instead of blackwater).

Greywater is recycled from all indoor end uses, with the exception of in the kitchen and toilet/urinal.

Again, Scenario 5 was run for varying combinations of differing non-potable end uses being serviced by roofwater run-off being collected in differing rainwater tank sizes.

» Scenario 6 (SP6)- Scenario 6 is similar to that proposed in Scenario 4, only greywater is recycled (instead of blackwater).

Again, Scenario 6 was run for varying combinations of differing non-potable end uses being serviced by roofwater run-off being collected in differing rainwater tank sizes.

2. Existing Infrastructure

2.1 Existing Potable Water Infrastructure

The nearest existing potable water infrastructure to the development site is as follows:

» DN150 mm diameter water main located in Burley Road;

» DN150 mm diameter water main located in Old Wallgrove Road (this main stops short of the site frontage to Old Wallgrove Road);

» DN100 mm diameter water main located in Bakers Road; and

» Warragamba to Prospect Main Water Supply Pipelines located along the northern boundary of the proposed development site.

The Main Water Supply Pipeline forming the northern boundary of the site would not be available for any potable water supply connection to the proposed development site.

The site is within the northern extremities of the Cecil Park Water System. The Cecil Park reservoir is located at Cecil Park at the southern extremities of the system boundaries. The Minchinbury Reservoir (part of the Minchinbury Water Supply System) is located approximately 2.5 km north of the proposed development site.

Sydney Water has confirmed that a potable water supply for Stage 1 of the development can be provided by the Minchinbury Water Supply System. Supply to further Stages of the development is likely to require major augmentation / upgrades to the existing system.

2.2 Existing Sewerage Infrastructure

The nearest existing sewerage infrastructure to the Stage 1-3 development area is a 525 mm diameter sewer carrier (Ropes Creek Carrier) located alongside Ropes Creek downstream of the proposed development area (approximately 1.3 km from the site).

The nearest existing sewerage infrastructure to the Stage 4 development area is the sewerage reticulation infrastructure associated with the M7 Business Hub immediately north of the Main Water Supply Pipelines. This existing development site drains to the Eastern Creek Carrier.

The proposed development site does not form part of any existing published Developer Servicing Plans (DSP). The proposed development site can be divided into three separate gravity catchments; the Ropes Creek, Kemps Creek and Reedy Creek catchments. Both Ropes Creek and Kemps Creek catchment drain naturally to the St Marys Sewage Treatment Plant (STP) while Reedy Creek drains naturally to the Quakers Hill STP.

The *Draft* St Marys Wastewater DSP (2006) has been reviewed and it is similar to previous issues of the DSP, in that no land south of the Main Water Supply Pipeline forms part of the catchment plan, and hence there are no system upgrades identified regarding the development of the site.

Sydney Water has indicated that there is no capacity within the current sewer system for the proposed development site and that major system augmentation/extension is likely to be required to service the site.

3. Proposed Development

3.1 Development Area

The total gross land area occupied by the proposed development site comprises 421 hectares, of which 270 hectares is assumed in this study to be utilised as net developable land. Further details of the land use spilt by area are detailed in Table 1.

Table 1 Development Area Split

Development Area Identification	
Development Lot and ID identification	Area (hectare)
Lot 2 DP 120673 (Stage 1)	62
Lot 82 DP 752041 (Stage 2)	141
Lot 87 DP 752041 (Stage 2)	3
Lot 1 DP 120673 (Stage 3)	127
Lot 1 DP 843901 (Stage 4)	88
Total Gross Area (Stage 1 to 4)	421
Preliminary Development Area Breakdown	
Areas within the Development	Approximate area (hectares)
Restricted areas (riparian buffer zones, 100-yr flood extents)	95
Regional roads and infrastructure	22
Estate park amenities (detention basins etc)	43
Approximate warehouse/office developable area (including hardstand, landscaping, access roads etc)	261 » 60% roof/awning (10% office and 50% warehouse); » 10% garden; and » 30% hardstand/access rd
Total Gross Development Area	421 (Stage 1 to 4)

3.2 Development Type Description

The development will consist of light industrial land uses (warehousing and distribution), but may also comprise some office premises.

3.3 Staging of Development

The development will likely progress in four main stages as follows:

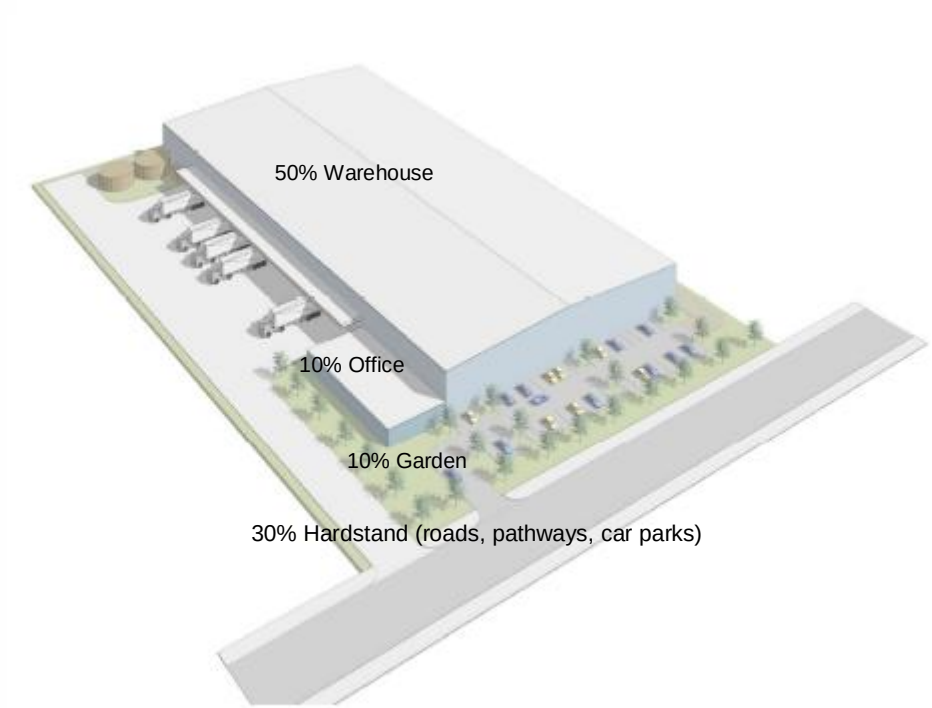
- Stage 1: Development of the portion of the total development identified as Lot 2 DP 120673 will proceed within 2-3 years upon receiving development approvals.
- Stage 2: Development of the portion of the total development identified as Lots 82 and 87 DP 752041 will proceed within 3-5 years upon initially receiving the development approval.
- Stage 3: Development of the portion of the total development identified as Lot 1 DP 120673 will proceed within 5 years (plus) of initially receiving the development approval.
- Stage 4: Development of the portion of the total development currently being utilised by Austral Bricks and identified as Lot 1 DP 843901 will proceed when the brickworks operations ceases (potentially 20-years plus).

4. Development Details and Assumptions

4.1 Typical Warehouse/Office Development Type

Goodman International Ltd has supplied GHD with the details of a generic warehouse facility (refer Figure 2). GHD has assumed that the net area within each stage of the development will be occupied by individual lot types similar to that of the generic warehouse facility.

Figure 2 Generic Warehouse Facility



A generic warehouse facility occupies a footprint of 2.04 hectares or 20,425 m^2. The area breakdown of each 2.04 hectare generic facility is as follows (and summarised by area in Table 2):

- 60% roof area comprising of warehouse (50%) /office (10%) space;
- 10% landscaped area; and
- 30% hardstand (including car parks, internal roads and footpaths).

Table 2 Proposed Warehouse Facility – Area Breakdown

Portion of Generic Proposed Warehouse Facility	Area (m^2)
Warehouse	10,212.5
Office	2042.5
Hardstand (including internal roads, footpaths, car parks)	6,127.5
Garden / Landscaped Area	2042.5
Total Area of Generic Proposed Warehouse Facility	20,425 m^2

4.2 Warehouse Development Staging

The approximate number of generic facilities (with a 2.04 hectares gross area) that could ideally be developed within a particular stage of the development is shown in Table 3 based on the net available land as summarised in Table 1.

Table 3 Generic Warehouse Facilities for Each Development Stage

Stage in Development	Generic facilities per Stage	Cumulative Number of generic facilities at Stage
Stage 1	20	20
Stage 2	46	66
Stage 3	42	108
Stage 4	24	132

5. Water Balance

5.1 General

The water balance was simulated using a water cycle management model to allow the evaluation of various elements of the water cycle to be assessed at differing stages in the development. The major assumptions included as part of the water balance model are outlined in Appendix B.

The model simulates the daily water cycle at each stage of the development for a range of differing servicing strategy scenarios for a 'dry', 'wet' and 'average' rainfall year (refer Appendix C). The water balance model is simulated on a daily time step. The model allows for differing identified end uses (refer Appendix D) to be serviced by either potable water, recycled (black or greywater) and/or rainwater.

5.2 Water Balance Objective

Potable water supplies in the Sydney area are in recognised short supply. With projected population increases, potential climate change and periods of extended drought any development in the Sydney region places increasing demands on an already scarce water supply. As a result, government bodies, together with Sydney Water have encouraged sustainable development by the implementation of an integrated approach to water cycle management (potable water, sewage, stormwater and rainwater) to minimise demands of potable water supplies.

In addition, Sydney Water has indicated that there is no capacity in the current sewer system for the proposed development site, and that major system augmentation/extension is likely to be required should centralised sewer infrastructure be required. As such, the development would be potentially required to manage its own sewage, which would involve treatment and disposal. Disposal of the developments treated sewage would essentially entail an allocation of land within the development for watering, this would result in a decreased area of land being available for developing. The re-use of the treated effluent (for non potable end use demands) within the development would be preferable to both:

» 'Dispose of the treated sewage' thereby minimising the required land in the development to be allocated for sewage disposal via watering (and in turn maximising developable land); and

» Minimise potable water demands via substitution of non-potable end use demands with recycled water.

Further, it is proposed to harvest the first 44mm/day of roofwater from across industrial warehouse roofs across the region (including the subject development site). This water will be temporarily stored and then pumped to Prospect Reservoir.

As a result of this scheme a number of scenarios were modelled based on the assumption that rainwater collected from the rooves of the development (up to 44 mm

per day) would not be available for utilisation within the development's integrated servicing strategy.

With the implementation of the Regional Roofwater Harvesting Scheme, further reliance is placed on recycled water as an alternative source of water to potable water. Should the substitution of recycled water by potable water sources be required to service non-potable end uses on the site, then it may actually be preferable (and a more sustainable solution) to utilise a portion of harvestable rainwater to supply a number of non-potable end uses.

As such, GHD has simulated a number of water balance scenarios to potentially demonstrate the extent to which a portion of the harvestable rainwater may be able to be utilised on-site to further maximise potable water savings and provide a more sustainable servicing option.

5.3 Water Balance End Uses

GHD has identified the following water demand end uses to be required across the development:

- toilet and urinal flushing, hand basin washing, showering;
- kitchen (food preparation, washing), drinking;
- air conditioning cooling;
- internal cleaning;
- leaking water devices.
- unaccounted for water;
- truck/car wash;
- external cleaning; and
- watering (outdoor garden use).

The basis for selection of water demand volumes by end use have been discussed individually in Appendix D, however, a summary of the breakdown by end use within a generic facility is shown in Table 4. In addition, Figure 3 shows the allocation of water demands by end use within the development.

Table 4 Summary of Adopted End Use Assumptions within a 'Generic Warehouse' or typical Tenancy

End Use (Water Demand)	Water Demand (L/day for a 'Generic Warehouse')	Percentage of Total 'Generic Warehouse' Total Water Demand	Assumptions
Toilet and Urinal Flushing	586	12%	Based on '3-star' toilet and urinal fittings.
Hand Basin Washing	348	7%	Based on 3 uses of the handbasin per person/day for 15 seconds each time using a 3-star tap fitting (8.5 L/min).
Showering	698	14%	20% of staff have showers each day for 8 minutes each time using a 3-star shower head (8L/min)
Kitchen (washing & drinking)	164	3%	3 L / EP/ day
Air Conditioning Cooling	496	10%	10% of total water consumption-of which 88% evaporates.
Leaking Water Devices	Negligible	0%	Traditionally 0.7% of total water consumption in residential dwellings is attributed to leaks (SWC, 2005). However, as the new dwellings will be fitted with efficient, correctly installed and appropriately maintained fittings- the water consumption attributed to leaking water devices was assumed to be negligible.
Unaccounted for Water	499*	10%*	Unaccounted for water accounted for 10% of overall water demand in 2005 (SWC, 2005). *It has been assumed that "unaccounted for water" is equivalent to 10% of pressurised water demands. In reality this will be made up from a portion of both the potable and non-potable demands. This results in an overall "unaccounted for water" demand, except in the case where rainwater tanks are used to supplement end uses. In this case the total "unaccounted for water" demand will be less than 10%.
Truck Wash	300	6%	Based on two trucks being washed each day, requiring 150 L per wash.
Internal Cleaning	74	1.5%	Based on the assumption that cleaning involves toilet flushing (8 toilet flushes- 24L) and mopping (5 buckets each 10 L- 50L).

End Use (Water Demand)	Water Demand (L/day for a 'Generic Warehouse')	Percentage of Total 'Generic Warehouse' Total Water Demand	Assumptions
External Cleaning	20	0.4%	Assuming each bucket of water requiring for mopping contains 10 L, GHD assume that two buckets of water will be required each day for washing external surfaces.
Watering (Outdoor Garden use)	1,777	36%	Using subsurface irrigation (and other water efficient watering methods)- the watering requiring during an 'average' rainfall year was assumed to be 0.88 mm/day (source unavailable).
Total (L/day/ Generic Warehouse **(or per 2.04 net hectares)**	4,962	100%	
Total (L/day/ net hectare)	2,432	-	

Figure 3 Water Demand Breakdown by End Use within the Development (for a Generic Warehouse)

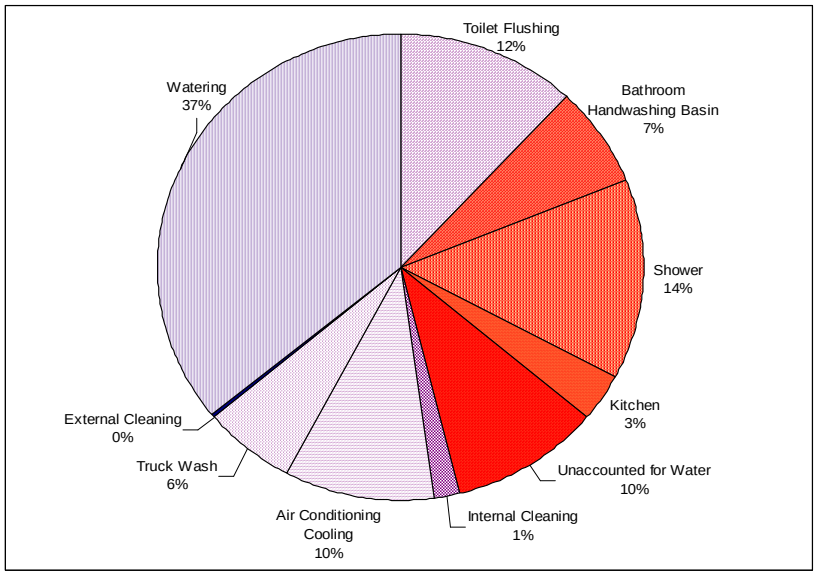


Figure 3 shows the proportion of total water demands within the development that may be potentially substituted for an alternative to potable water in purple (or unshaded). The proportion of total water demands within the development that could be serviced

with a non-potable water supply equate to approximately 66% to 76% (allowing for unaccounted for water)of the total water demands for the development.

The remaining 24 to 34% of the Development's water demands require a potable water supply.

As such, maximising the substitution of end use demands that do not require a potable water source would result in a maximum achievable potable water saving in the order of 66% to 76%.

5.4 Water Balance Scenarios

By incorporating the water demand end uses of the development, with the Regional Roofwater Harvesting Scheme and the water and sewer servicing strategy objectives (Section 5.2), GHD has investigated the following servicing strategy Water Balance Scenarios:

» Scenario 1 (SP1)– the availability of black recycled water for all non potable end uses (toilet flushing, air conditioning cooling, cleaning, truck wash and watering).

  The recycling of blackwater assumes that all flow to the sewer will be available for recycling.

» Scenario 2 (SP2)- the availability of grey recycled water for all non potable end uses (toilet flushing, air conditioning cooling, cleaning, truck wash and watering).

» Scenario 3 (SP3)- the availability of black recycled water for all non potable end uses (with the exception of that allocated as serviced by roofwater), together with rainwater exceeding 44mm/day being captured for use for non potable end uses (as allocated).

  Scenario 3 was run for varying combinations of differing non potable end uses being serviced by roofwater collected in differing sized rainwater tanks.

» Scenario 4 (SP4)- the availability of black recycled water for all non potable end uses (with the exception of that allocated as serviced by rainwater), together with rainwater being captured for use as required for non potable end uses (as allocated). All rainwater that is not utilised in the development is assumed to be temporarily stored and pumped to Prospect Reservoir. As a result, Scenario 4 assumed an amended operation of the 'Eastern Creek Roofwater Harvesting Scheme' to that currently proposed by Sydney Water.

  Again, Scenario 4 was run for varying combinations of differing non potable end uses being serviced by rainwater being collected in differing rainwater tank sizes.

» Scenario 5 (SP5)- Scenario 5 is similar to that proposed in Scenario 3, only greywater is recycled (instead of blackwater).

  Greywater is recycled from all indoor end uses, with the except of in the kitchen and toilet/urinal.

  Again, Scenario 5 was run for varying combinations of differing non potable end uses being serviced by roofwater being collected in differing rainwater tank sizes.

» Scenario 6 (SP6)- Scenario 6 is similar to that proposed in Scenario 4, only greywater is recycled (instead of blackwater).

Again, Scenario 6 was run for varying combinations of differing non potable end uses being serviced by roofwater being collected in differing rainwater tank sizes.

5.5 Water Balance Results

The water balance simulation of the water cycle allows various elements of the water cycle to be analysed as the development progresses, these results have been simulated for the four main stages of development (Stage 1, Stage 2, Stage 3 and Stage 4 (refer Section 3.3).

For each of the servicing strategy scenarios, figures have been generated that show daily time steps and 28-day moving average for each water balance scenario at a particular stage in the development and for a particular yearly rainfall pattern (average, dry and wet) for the output listed below. Full sets of figures for each servicing strategy scenario at each stage are shown in Appendix F, however Figure 4 and Figure 5 provide an example of the water balance output for Scenario 1 and Scenario 2 respectively for 'Stage 1' of the development during the 'average' rainfall year (that is, a scenario with blackwater reuse and greywater reuse respectively).

Figure 4 and Figure 5 will be used as an example reference below to explain the detailed output of the Water Balance as shown in graphical format in Appendix F.

Explanations are as follows:

» Available Recycled Water (Figure 4a)- Shows the flow to sewer, which is equivalent to the total available recycled water for blackwater reuse. A comparison of the rainfall pattern with the available recycled water exhibits that greater volumes of recycled water are available during a period of heavy rainfall due to wet weather infiltration. The available recycled water (or flow to sewer) at the completion of Stage 1 of the development is in the order of 16 ML/annum, equating to an average flow of 0.044 ML/day. The maximum record of available recycled water was 259 kL/day on Day 70 of the year, the day that received 56mm of rainfall, the highest volume of rainfall for the 'average' rainfall year. The minimum volume of available recycled water was 37 kL/day.

» Surplus Recycled Water (Figure 4b)- Shows the amount of recycled water remaining from the 'available recycled water' after subtracting all the recycled water demands. This surplus recycled water would require disposal. The only recycled water demand that is dependant on external factors is outdoor watering uses. The demands for outdoor watering are highest during drier weather- as shown in the Surplus recycled water figure (Figure 3 b), the surplus recycled water was greatest during periods of higher rainfall (for example Day 70 of the year) when surplus water was 227 kL, and vice versa when the watering demands are high in periods of dry rainfall. However, generally there is an overall deficit of recycled water (approximately 41 kL/day on average), resulting in a portion of recycled water demand being substituted by potable water supplies.

- Potable Substitution of Recycled Water (Figure 4c)- The recycled water that is required to be substituted by potable water to meet demands is shown in Figure 3c. The potable substitution of recycled water is equivalent to the deficit in recycled water. It can be seen that the average day requires 41kL of potable substituted water to make up for the deficit in recycled water being available.
- Recycled Watering (Figure 4d)- shows the outdoor watering that is required when the moisture level of the garden drops below 25%. The average level of watering across the 'average' rainfall year equates to 0.87 mm/day, resulting from watering 1.1mm of recycled water each time the moisture level of the garden drops below 25%.
- Rainwater Tank Uses (Figure 4e)-Shows the rainwater that is utilised by the rainwater tank. However, as scenario 1 does not incorporate the use of rainwater tanks in the servicing strategy the rainwater tanks are displayed as being un-utilised.
- Potable Substitution of Rainwater Tank Water (Figure 4f)- Shows when the rainwater tank supply of water falls short of the demands for rainwater tank water, in which case a portion of the rainwater tank water demands would be met by substituted potable water. However, as mentioned above, in the example scenario (Scenario 1), it does not utilise rainwater tanks for any source of water, therefore no substitution of rainwater tank water would be required.

Figure 5 (Scenario 2) shows similar output to Figure 3 (Scenario 1) only for the use of greywater for recycling (in place of Blackwater recycling), the major differences are described below:

- Available Grey Recycled Water (Figure 5a)- Shows the volume of greywater that flows to sewer and is available for recycling. The remainder of the effluent flow (kitchen and toilet water) is not available for reuse and flows directly to the sewer for treatment and disposal.
- Surplus Grey Recycled Water (Figure 5b1)- Shows the amount of recycled water remaining from the 'available grey recycled water' after subtracting all the grey recycled water demands.
- Flow to Sewer=Blackwater and Surplus Grey Recycled Water (Figure 5b2)-The flow to sewer in Scenario 2 automatically assumes that all toilet and kitchen water (blackwater) is not available for reuse and therefore travels directly to the sewer together with any surplus grey recycled water.
- Figure 5c-f are similar to that of Figure 3.

Figure 4 Example of Graphical Output from Water Balance Model- Scenario 1, Stage 1 for the 'Average' Rainfall Year

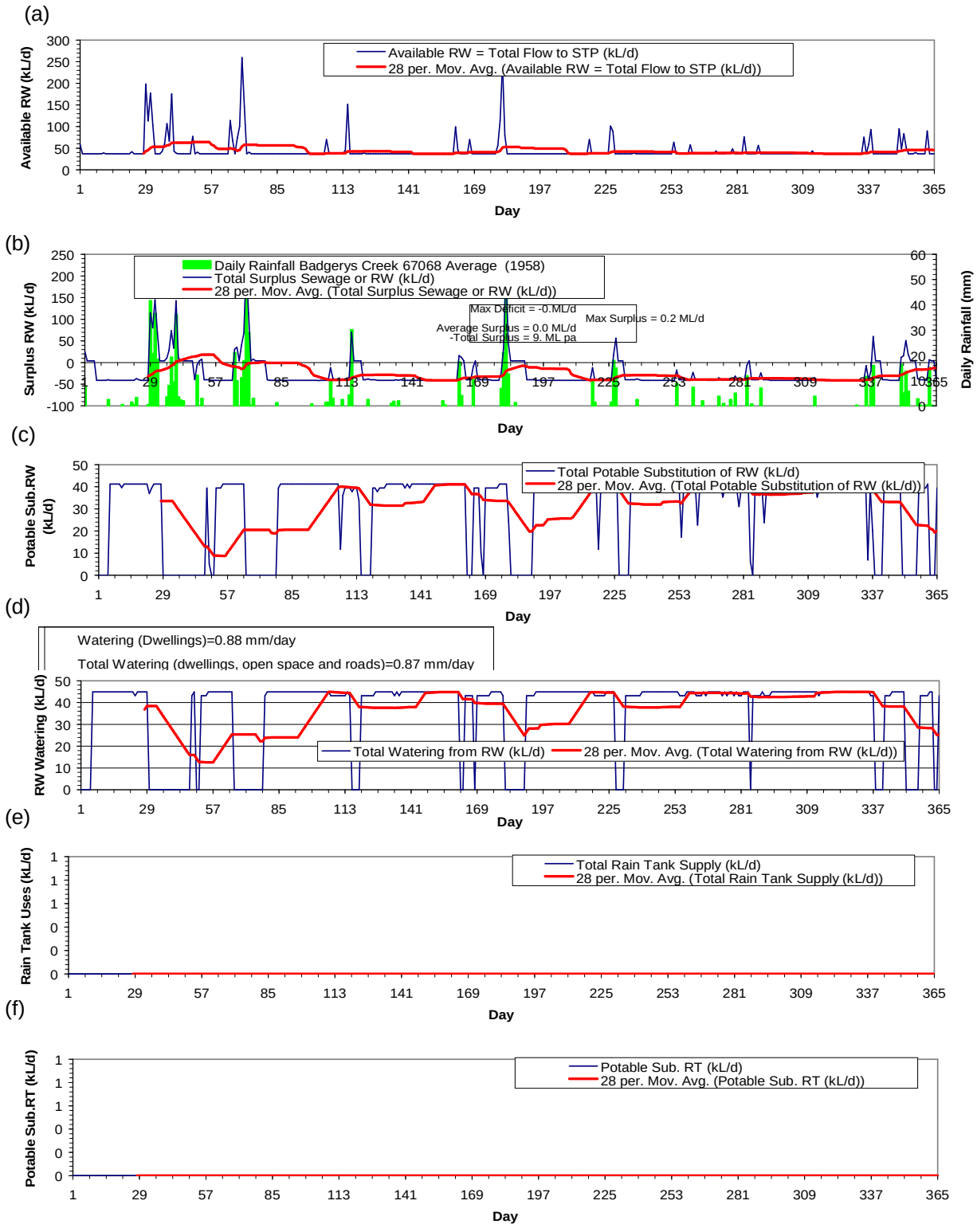
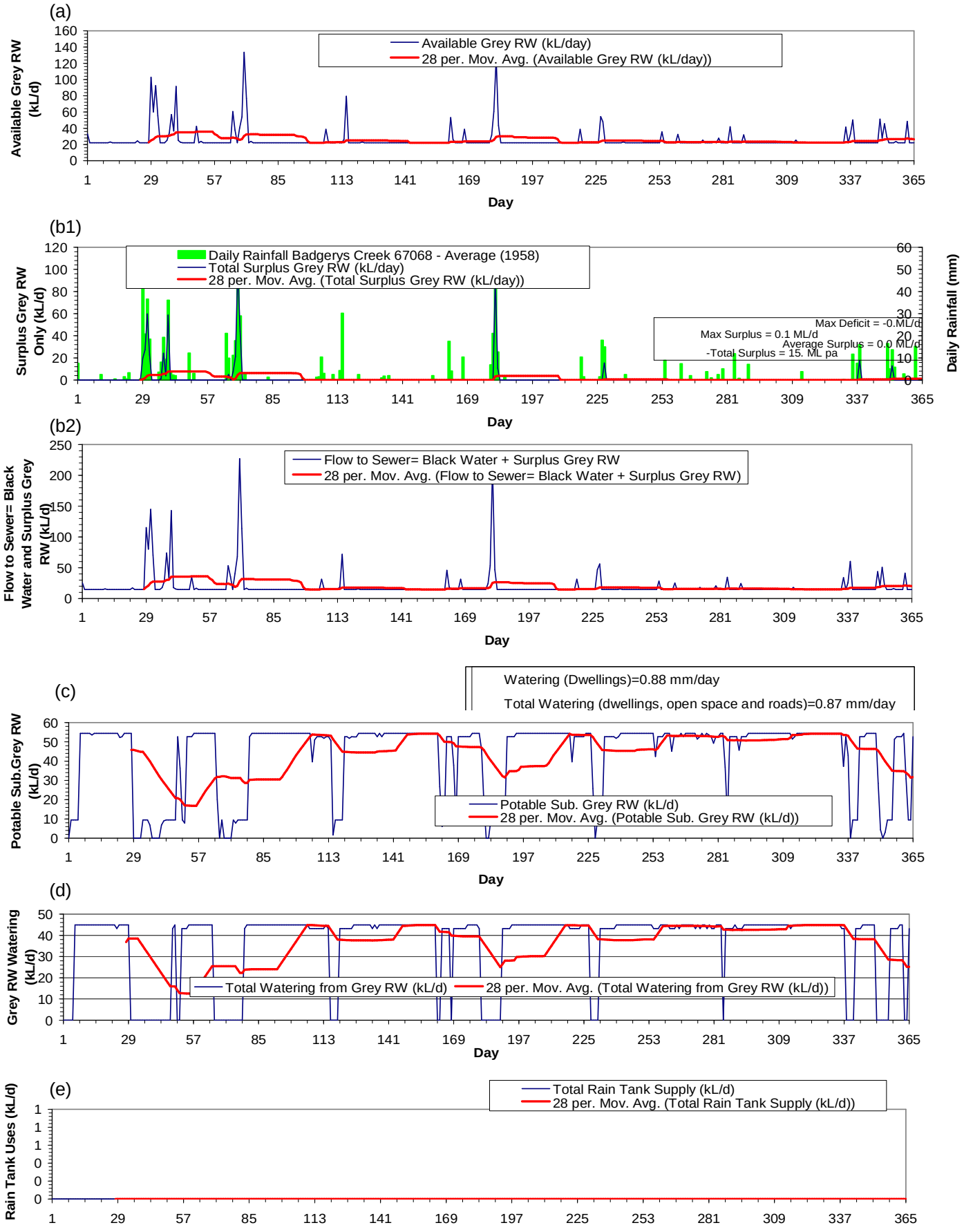


Figure 5 Example of Graphical Output from Water Balance Model- Scenario 1, Stage 2 for the 'Average' Rainfall Year



A complete summary of potable water utilised, surplus/deficit recycled water, potable water reductions and other factors of interest for this scenario at all stages of development for differing rainfall conditions is available in Appendix G. However, the report will predominantly make reference to Stage 1 of the development during 'average' rainfall conditions for comparative purposes unless stated otherwise. It should also be noted that the majority of the later scenario runs (Scenarios 3-6) were run for Stage 1 of the development only (for comparative purposes).

5.5.1 Scenario 1 (SP1)- Stages 1 to 4.

Scenario 1 results in a reduction of between 37 to 43% of potable water use (depending on the rainfall year) resulting from the blackwater recycling for non-potable end uses across Stages 1 to 4.

This potable water reduction at Stage 1 in the 'average' rainfall year corresponds to 22 ML/annum potable water use and 14 ML/annum recycled water use. This scenario results in a 9 ML/annum deficit of recycled water (which would require substitution by potable water). Scenario 1 results in approximately 16 ML/annum of recycled (black) water available for reuse. A summary of results is shown in Table 5.

Table 5 Summary of Scenario 1 – Stage 1 Key Water Balance Results

Scenario	Details	Potable Water Saving (%) across all rainfall types	'Average' Potable Water Saving (%)	Surplus Effluent (ML/annum) for 'Average Rainfall Conditions (note: a negative surplus = a deficit)	Rainwater Tank Utilised (ML/annum) for 'Average' Rainfall Conditions
1	Stage 1 Recycled Blackwater Reuse	37-42%	39%	-9.2	N/A

5.5.2 Scenario 2 (SP2)- Stages 1 to 4

Scenario 2 results in a reduction of between 23% to 29% of potable water (depending on the rainfall year) from that of implementing grey recycled water to substitute non-potable end uses across Stages 1 to 4.

This potable water reduction at Stage 1 in the 'average' rainfall year corresponds to 27 ML/annum potable water use and 9 ML/annum recycled water use. This scenario results in a 15 ML /annum deficit of recycled water (which would require substitution by potable water). Scenario 2 results in approximately 9 ML/annum of recycled (grey)

water available for reuse and 7.2 ML/annum flowing to sewer (as surplus greywater and unutilised blackwater).

****

Scenario 2 results in usage of approximately 15% more potable water than that of Scenario 1- this is predominantly due to the decreased volume of treated effluent being available for reuse (that is, greywater rather than all flow to sewer (blackwater)).In addition, as Scenario 2 is not maximising the usage of effluent generated (by only recycling greywater), a portion of flow to sewer (blackwater) is not recycled and automatically becomes surplus effluent together with the surplus greywater. As a result, the flow to the sewer that requires treatment and disposal from Scenario 2 is much greater than in Scenario 1. A summary and comparison of Scenario 1 and 2 results is provided in Table 6.

Table 6 Summary of Scenario 1 and Scenario 2 – Stage 1 'Key' Water Balance Results

Scenario	Details	Potable Water Saving (%) across all rainfall types	'Average' Potable Water Saving (%)	Surplus Effluent (ML/annum) for 'Average Rainfall Conditions (note: a negative surplus = a deficit)	Rainwater Tank Utilised (ML/annum) for 'Average' Rainfall Conditions
1	Stage 1 Recycled Blackwater Reuse	37-42%	39%	-9.2	N/A
2	Stage 1 Recycled Greywater Reuse	23-29%	24%	7.2	N/A

5.5.3 Scenario 3 (SP3)- Stages 1

All Scenario 3 Water Balance runs were run (for multiple rainfall conditions) for Stage 1 of the development only.

Scenario 3 involved the utilisation of available black recycled water, together with rainwater exceeding 44/mm being captured for use for the non-potable end use of toilet flushing.

This Scenario was modelled for both a 20 kL and a 30 kL tank fitted to each Generic Proposed Warehouse.

Scenario 3 resulted in a reduction of between 36-42% of potable water (depending on the rainfall year and either the application of a 20 kL or 30 kL rainwater tank). The potable water saving in Scenario 3 (with either a 20 kL or 30 kL rainwater tank) resulted in a similar potable water saving to that of Scenario 1, despite the addition of utilising a rainwater tank. This result is so because, only between 1-1.5 ML/annum of rainwater was utilised (for a 20-30 kL rainwater tank) out of a potential rainwater demand of 4.3 ML/annum (during an 'average' rainfall year).

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Overall, the use of a rainwater tank to substitute toilet water demands appear to be inefficient when only utilising rainfall in excess of 44mm/day as there is a high reliance on 'heavy' downpours, and as a result a significant reliance on long term storage (between heavy downpours). In addition, no potable water savings are gained from the presence of rainwater tanks during the 'dry' rainfall year when collecting runoff in excess of 44mm/day during 'dry' rainfall years.

A summary and comparison of Scenarios 1-3 is provided in Table 7.

Table 7 Summaries of Scenario 1, Scenario 2 and Scenario 3 – Stage 1 'Key' Water Balance Results

Scenario	Details	Potable Water Saving (%) across all rainfall types	'Average' Potable Water Saving (%)	Surplus Effluent (ML/annum) for 'Average Rainfall Conditions (note: a negative surplus = a deficit)	Rainwater Tank Utilised / Optimum Rainwater Tank Demand (ML/annum) for 'Average' Rainfall Conditions
1	Stage 1 Recycled Blackwater Reuse	37-42%	39%	-9.2	N/A
2	Stage 1 Recycled Greywater Reuse	23-29%	24%	7.2	N/A
3	Stage 1 Blackwater Reuse with 20 kL Rainwater Tank servicing Toilet End Uses (only collecting runoff in excess of rainfall of 44mm/day)	36-42%	39%	-4.8	1 /4.3
3	Stage 1 Blackwater Reuse with 30 kL Rainwater Tank servicing Toilet End Uses (only collecting runoff in excess of rainfall of 44mm/day)	36-44%	40%	-4.8	1.5/4.3

5.5.4 Scenario 4 (SP4)- Stage 1

All Scenario 4 Water Balance runs were run (for multiple rainfall conditions) for Stage 1 of the development only.

Scenario 4 involved the utilisation of available black recycled water for all non-potable end uses (with the exception of that allocated as serviced by rainwater), together with roofwater being captured for use as required for non-potable end uses (as allocated). All roofwater in this scenario that was not utilised in the development is assumed to be temporarily stored and transferred to the Regional Roofwater Harvesting Scheme.

In order to select the rainwater tank size which would be 'optimal' in servicing the demands required by particular combinations of end uses, a rain water tank analysis was conducted (see Appendix E for details). As shown in Table 8, the outcomes of this rainwater tank analysis resulted in the selection of a range of potentially 'optimal' rainwater tank sizes to service particular combinations of non-potable end uses together with 'acceptable' potable substitution percentages.

Table 8 Potable Substitution Required to Service Particular 'Optimal' Rainwater Tank Sizes and Asssociated End Use Demands

End Uses Services by the Rainwater Tank	Rainwater Tank Size	Substitution Required as a % of the Total Ideal Rainwater Demand (for 'average' rainfall)
Toilet Flushing	15 kL	12%
	20 kL	4%
Toilet Flushing and Truck Washing	20 kL	18%
	25 kL	10%
	30 kL	4%
Toilet Flushing, Truck Washing and Air Conditioning Cooling Water	25 kL	27%
	30 kL	21%
	35 kL	15%

As a result, the water balance modelling was conducted for Scenario 4 (SP4- Stage 1 only) with rainwater tanks servicing the permutation and combinations of particular end uses as shown in Table 8.

The key results of the water balance for Scenario 4 are displayed in Table 9 below and further expanded in Appendix G.

Scenario 4 – with Rainwater Tanks for Service Toilet Flushing End Use

Scenario 4 with rainwater tanks for servicing toilets resulted in potable water savings of between 47-48%. The implementation of rainwater tanks to service toilet flushing end uses resulted in an additional potable water saving of approximately 8-9% when

compared to Scenario 1 (blackwater recycling without the implementation of rainwater tanks).

An effluent deficit of 4.8 ML/annum (during average rainfall conditions) was achieved in Scenario 4 with rainwater tanks for servicing toilets. Therefore, the implementation of rainwater tanks for servicing toilets in addition to blackwater recycling resulted in a decreased deficit of recycled effluent when compared to Scenario 1.

Further, the rainwater tanks sized to service toilet flushing water uses in Scenario 4 (15kL and 20 kL) result in potable water substitutions between 4-12% respectively, which is judged as an acceptable proportion of potable water substitution to deem the rainwater tank as adequately utilised.

Scenario 4 – with Rainwater Tanks for Service Toilet Flushing and Truck Washing End Uses

Scenario 4 with rainwater tanks for servicing toilets and truck washing resulted in potable water savings of between 50-52%. The implementation of rainwater tanks to service toilet flushing and truck washing end uses resulted in additional potable water saving of approximately 11-13% when compared to Scenario 1 (blackwater recycling with the implementation of rainwater tanks).

While the implementation of rainwater tanks to service toilet flushing and truck washing only resulted in a 3-4% increase in potable water savings from that of solely implementing rainwater tanks for toilet flushing, the current scenario resulted in a significant decrease in the recycled water deficit. The recycled water deficit in this scenario was 2.4 ML/annum (during the average rainfall year).

Again, in this Scenario, rainwater tanks ranging between 20-30 kL resulted in potable water substitutions of between 4-18%, deemed to be adequately utilised.

Scenario 4 – with Rainwater Tanks for Service Toilet Flushing, Truck Washing and Air Conditioning Cooling Water End Uses

Scenario 4 with rainwater tanks for servicing toilets, truck washing and air conditioning resulted in potable water savings of between 53-57%. The implementation of rainwater tanks to service toilet flushing, truck washing and air conditioning cooling end uses resulted in additional potable water savings of approximately 14-18% when compared to Scenario 1 (blackwater recycling with the implementation of rainwater tanks).

However, this scenario results in a surplus of recycled water of 1.3 ML/annum (during the average rainfall year). This surplus in effluent is generated as a result of over substitution of non-potable end uses from recycled blackwater to rainwater tank water. This surplus in effluent however, may be able to be managed via disposal via watering (similar to that conducted in wet weather).

It should be noted that in this scenario, the rainwater tanks ranging between 25-35 kL continue to be deemed adequately utilised-resulting in potable water substitutions of between 15-27%.

Table 9 Summary of Permutations & Combinations of Scenario 4 – Stage 1 'Key' Water Balance Results

Scenario	Details (Stage 1- collecting rainwater as required by rainwater tank with all excess rainwater being pumped to prospect reservoir)	Potable Water Saving (%) across all rainfall types	'Average' Potable Water Saving (%)	Surplus Effluent (ML/annum) for 'Average Rainfall Conditions (note: a negative surplus = a deficit)	Rainwater Tank Utilised / Optimum Rainwater Tank Demand (ML/annum) for 'Average' Rainfall Conditions
4	Blackwater Reuse with 15 kL Rainwater Tank servicing Toilet End Uses	44-49%	47%	-4.8	3.7/4.3
4	Blackwater Reuse with 20 kL Rainwater Tank servicing Toilet End Uses	45-48%	48%	-4.8	4.1/4.3
4	Blackwater Reuse with 20 kL Rainwater Tank servicing Toilet & Truck Wash End Uses	47-52%	50%	-2.4	5.3/6.6
4	Blackwater Reuse with 25 kL Rainwater Tank servicing Toilet & Truck Wash End Uses	49-53%	51%	-2.4	5.8/6.6
4	Blackwater Reuse with 30 kL Rainwater Tank servicing Toilet & Truck Wash End Uses	50-53%	52%	-2.4	6.2/6.6
4	Blackwater Reuse with 25 kL Rainwater Tank servicing Toilet, Truck Wash and Air Conditioning End Uses	50-56%	53%	1.3	7.5/10.3
4	Blackwater Reuse with 30 kL Rainwater Tank Servicing Toilet, Truck Wash & Air Conditioning	52-57%	55%	1.3	8.1/10.3
4	Blackwater Reuse with 35 kL Rainwater Tank Servicing Toilet, Truck Wash & Air Conditioning	53-57%	57%	1.3	8.7/10.3

5.5.5 Scenario 5 (SP5)- Stage 1

All Scenario 5 Water Balance runs were run (for multiple rainfall conditions) for Stage 1 of the development. Scenario 5 involved the utilisation of available grey recycled water for all non-potable end uses (with the exception of toilet water), toilet water and truck washing was serviced by a rainwater tank (either of volume 20kL or 30 kL). Only runoff in excess of 44 mm /day was potentially utilised by the rainwater tank.

As such, the rainwater tanks in Scenario 5 were 'poorly' utilised, resulting in potable substitutions of between 73-82% of total toilet water demand.

Scenario 5 resulted in potable water savings ranging between 23-30% across rainfall conditions. The addition of a rainwater tank in Scenario 5 only results in an increase of approximately 1% potable water when compared to Scenario 2 (which only utilises greywater recycling). A summary of the Scenario 5 results with comparisons to Scenarios 1 and 2 is provided in Table 10.

Table 10 Summaries of Scenario 5 (with comparison to Scenarios 1 and 2) – Stage 1 'Key' Water Balance Results

Scenario	Details Stage 1	Potable Water Saving (%) across all rainfall types	'Average' Potable Water Saving (%)	Surplus Effluent (ML/annum) for 'Average Rainfall Conditions (note: a negative surplus = a deficit)	Rainwater Tank Utilised / Optimum Rainwater Tank Demand (ML/annum) for 'Average' Rainfall Conditions
1	Recycled Blackwater Reuse	37-42%	39%	-9.2	N/A
2	Recycled Greywater Reuse	23-29%	24%	7.2	N/A
5	Greywater Reuse with 20 kL Rainwater Tank servicing Toilets & Truck Wash End Uses (only collecting runoff in excess of rainfall of 44mm/day)	23-27%	25%	8.1	1/5.6
5	Greywater Reuse with 30 kL Rainwater Tank servicing Toilets & Truck Wash End Uses (only collecting runoff in excess of rainfall of 44mm/day)	23-30%	26%	8.1	1.5/5.6

5.5.6 Scenario 6 (SP6)- Stage 1

All Scenario 6 Water Balance runs were run (for multiple rainfall conditions) for Stage 1 of the development. Scenario 6 involved the utilisation of available grey recycled water for all non potable end uses (with the exception of toilet water and truck washing), toilet water and truck washing were serviced by a rainwater tank (with a volume of between 20-35 kL). Rainwater was captured as required, and all rainwater that was not utilised in the development was assumed to be temporarily stored and transferred to the Regional Rainwater Harvesting Scheme.

This scenario was run for a variety of rainwater tank sizes (between 20-35kL) that resulted in acceptable potable substitution percentages to service toilet and truck wash water demands (see Appendix E for details).

Scenario 6 resulted in potable water savings of between 35-42%. The implementation of rainwater tanks to service toilet flushing and truck washing end uses resulted in an additional potable water saving of approximately 13-18% when compared to Scenario 2 (greywater recycling without the implementation of rainwater tanks).

While this scenario resulted in substantial potable water savings, the potable water savings achieved via implementing a combination of rainwater tanks and blackwater recycling results in a further increase in potable water savings in the order of 10-20%.

In addition, the implementation of this scenario results in surplus flow to the sewer of 8.1 ML/annum in the ‘average’ rainfall year (requiring treatment and disposal). The results of the Scenario 6 results is provided in Table 11.

Table 11 Summaries of Permutations and Combinations of Scenario 6 – Stage 1 'Key' Water Balance Results

Scenario	Details (Stage 1- collecting rainwater as required by rainwater tank with all excess rainwater being pumped to prospect reservoir)	Potable Water Saving (%) across all rainfall types	'Average' Potable Water Saving (%)	Surplus Effluent (ML/annum) for 'Average Rainfall Conditions (note: a negative surplus = a deficit)	Rainwater Tank Utilised / Optimum Rainwater Tank Demand (ML/annum) for 'Average' Rainfall Conditions
6	Greywater Reuse with 20 kL Rainwater Tank servicing Toilet and Truck Wash End Uses	35-41%	37%	8.1	5.3/6.6
6	Greywater Reuse with 25 kL Rainwater Tank servicing Toilet and Truck Wash End Uses	36-41%	39%	8.1	5.8/6.6
6	Greywater Reuse with 30 kL Rainwater Tank servicing Toilet & Truck Wash End Uses	37-42%	40%	8.1	6.2/6.6
6	Blackwater Reuse with 35 kL Rainwater Tank servicing Toilet & Truck Wash End Uses	38-42%	41%	8.1	6.5/6.6

6. Water Balance Discussion and Conclusions

The results of the water balance analysis for scenarios that do not utilise rainwater tanks (and only utilise either grey/blackwater for recycling) indicate that deficits occur in available recycled water that would require potable substitution.

The amount of potable water substitution could be decreased by supplementing certain non-potable water end uses with roofwater run-off.

The implementation of the proposed Regional Roofwater Harvesting Scheme will result in all rainwater below 44 mm /day being temporarily stored (daily only) prior to being pumped to Prospect Reservoir. A number of scenarios were therefore modelled based on the assumption that rainwater collected from the rooves of the development (up to 44 mm per day) would not be available for utilisation within the developments integrated servicing strategy.

Water balance modelling which incorporated the harvesting of runoff from the rooves of the development in excess of 44 mm/day resulted in negligible (if any) potable water savings (from that of a scheme without the addition of rainwater tanks to the scenario).

GHD have simulated a number of water balance scenarios to potentially demonstrate the extent to which a portion of the harvestable rainwater from rooves may be able to be utilised on site to further maximise potable water savings (and provide a more sustainable servicing option). The results of such scenarios indicate that measurable reductions in potable water use can be achieved.

It is therefore recommended that the proposed Regional Roofwater Harvesting Scheme be amended to enable the development site to harvest rainwater as required. The remaining (or uncaptured) rainwater would flow to the Regional Roofwater Harvesting Scheme.

Scenarios have been run that modelled the water balance from this suggested amended proposal of roofwater management. The scenarios investigated utilised differing permutations and combinations of rainwater tank sizes and end uses that the various rainwater tanks would service. A preliminary analysis of the water balance results (without conducting detailed sustainability analysis or sensitivity analysis) indicated that the implementation of either a 25 kL or 30 kL rainwater tank for servicing toilet flushing and truck washing in each generic facility would appear to be the most ‘sustainable’ servicing strategy to implement across the development. This is based on the following:

» The use of blackwater for recycling is preferable to greywater recycling, as blackwater recycling ensures that the reuse of effluent generated is maximised (therefore reducing potable water demand), and further reducing the volumes of effluent that require treatment and disposal;

» The implementation of a rainwater tank to service toilet flushing and truck washing would result in a decreased deficit of recycled water (i.e a decreased reliance on recycled water). This deficit in recycled water becomes a surplus when an

additional end use (such as air conditioning cooling water demands) is added to the roofwater tank demands, displaying an unnecessary reliance on roofwater when recycled water is already available. Therefore, the optimal scenario limits the use of rainwater tanks to servicing toilet flushing and truck washing;

» The rainwater tanks are 'adequately' utilised in this scenario, that is, only requiring minimal (or acceptable) substitution by a potable water source to meet the rainwater tank demands; and

» Potable water savings are approximately 50%, resulting in substantial potable water savings when compared to other scenarios.

It should be noted that the highest theoretical potable water saving achievable for the development is 66% based on the proposed proportion of end uses which are permissible to be serviced by non-potable water sources.

A number of additional scenarios were modelled based on an alternative warehouse footprint to that adopted in the main body of this report. The results are summarised in Appendix A.

The development scenarios considered in the water balance modelling do not necessarily represent the final development scenarios. Other alternative development footprints may be adopted. When the final development scenarios are known and as development proceeds detailed water balance modelling should be carried out.

7. References

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Appendix A

Technical Addendum – Additional modelling scenarios

Goodman International Limited

Water Balance
Options Report- Part 1

Technical Addendum

December 2007

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Preamble

This Technical Addendum supplements GHD's Water Balance Options – Part 1 investigation report (GHD, December 2007). The addendum outlines additional water balance modelling that was undertaken as a result of revised development background information provided by Goodman International Ltd at a workshop held on the 30 April 2007. This Technical Addendum should be read in conjunction with the Water Balance Options – Part 1 investigation Report.

Water Balance Overview

The preliminary results detailed in the Water Balance Options – Part 1 report (GHD, December 2007) clearly exhibited the following preferred servicing strategy;

» Prioritise blackwater recycling first, followed by;

» The use of roofwater run-off harvested from facility rooves to meet any deficits in non-potable end uses.

This strategy maximises potable water savings, reduces effluent generation and provides the most efficient use of resources.

Following the workshop with Goodman International Ltd on the 30 April 2007, GHD refined the preferred servicing strategy based on revised development background information to incorporate the following:

» Reduced lot-by-lot and cluster scale system inflow / infiltration rates during wet weather; and

» Revised development occupation density from 55 EP to 27 EP per generic warehouse facility.

The adopted refinements each result in greater dependence on roofwater run-off compared to the water balance results previously reported. That is, the adopted refinements represent a 'higher end' of roofwater usage (incurred with the lower occupation density of 27 EP/generic lot), requiring approximately 85 ML/year of roofwater run-off (ultimate development stage, 'average' rainfall) to supplement shortfalls in recycled water.

It should be noted that the revised scenarios modelled utilised a 70kL local rainwater tank (per Generic Warehouse (27EP)) to service the watering requirements. This equates to approximately 35kL/net ha. This local rainwater tank was substituted by potable water as required. The remainder of the recycled water end uses (that is, all non-potable water demands except watering) are substituted by potable water.

This roofwater run-off usage represents:

» 7.0% (or 53mm/year) of the run-off that would have otherwise formed part of Oakdale's contribution to the proposed Regional Roofwater Harvesting Scheme. Oakdale's contribution to the rainwater harvesting scheme is based on capturing 1,216 ML/year or 752 mm/year (in the 'average' rainfall year). It should be noted that the total rainfall for the average rainfall year was calculated to be 774 mm. 22 mm/year of this rainfall was not captured as this rainfall exceeded the Regional Roofwater Harvesting Scheme's daily rain tank capturing capacity of 44 mm/day;

» Martens and Associates (letter DEUS, 15 March 2007) has estimated that during the 'average' rainfall year the total Regional Roofwater Harvesting Scheme would capture 6,160 ML/year (from 791 hectares of roof area across the Oakdale and other associated development sites). Based on Martens and Associates calculations, the Oakdale development would utilise less than 1.4% of the total Scheme rainfall captured.

By comparison, for a 'dry' rainfall year, it is estimated that the proposed development would utilise 12% of the locally captured roofwater run-off, representing approximately 2.4% of the total Regional Roofwater Harvesting Scheme capture. The 'lower end' of the roofwater usage (incurred with the higher occupation density of 55 EP/generic lot) is estimated to represent 6.6% of Oakdale's contribution to the Scheme (80 ML/year, ultimate stage, 'average' rainfall), or approximately 1.2% of the total Scheme capture.

In summary, the revised scenarios that were modelled (i.e. for 27 EP/generic lot) resulted in the following for the 'average' rainfall year at the ultimate stage of the development:

- **Cluster Scale Servicing**: approximately 18.8 ML/year of surplus recycled water, utilisation of 6.8% of Oakdale's contribution to the Regional Roofwater Harvesting Scheme the local rainwater supply, and 71% saving in potable water requirements. This equates to a potable water demand of approximately 56.2 ML/year (including 17 ML/year of potable substitution to make up non-potable deficits). Approximately 83 ML/year of roofwater run-off, 48 ML/year of recycled water and 17 ML/year of potable substitution will service non-potable water demands.
- **Lot Scale (Fully Decentralised) Servicing**: no surplus recycled water, utilisation of 7.0% of Oakdale's contribution to the Regional Roofwater Harvesting Scheme and 70% saving in potable water requirements. This equates to a potable water demand of approximately 56.2 ML/year (including 17 ML/year of potable substitution to make up non-potable deficits). Approximately 85 ML/year of roofwater run-off, 46 ML/year of recycled water and 17 ML/year of potable substitution will service non-potable water demands.

1. Introduction

1.1 Outcomes of Water Balance Workshop

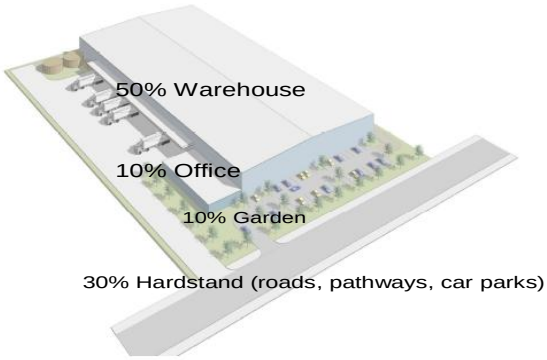
At the workshop held on 30 April 2007, Goodman International Ltd requested that GHD further investigate the effects on the water balance of the preferred servicing strategy taking into account the following considerations:

» The impact of the office area only occupying 6% as opposed to the original 10% of the 'generic warehouse area' (and 50% and 54% warehouse area respectively, refer Figure 1). This assumption results in no change to the overall roof size of each 'generic warehouse'. However, as the office size has been reduced in size by 40%, this will result in a reduced population occupying each generic warehouse.

GHD have investigated the water balance results incurred when adopting an equivalent population of half that originally assumed. That is, approximately 27 EP allowed for each generic warehouse, as opposed to the original 55 EP.

Figure 1 Generic Site- Warehouse Facility

(a) Generic Warehouse Facility (55EP)



(b) Generic Warehouse Facility (27EP)

» The impact on the wet weather infiltration on servicing the site via decentralised sewer systems (on a lot by lot or cluster scale) as opposed to a previously assumed centralised system.

Wet weather infiltration into the sewer system is influenced by a number of factors, including the following:

- The age of the sewer and the quality of maintenance, that is, as a sewer system gets older infiltration gradually increases. The rate of increase of infiltration within a sewer is approximately 0.1% each year (as discussed in the Water Balance Options Report, Part 1).
- The number of sewer connections to properties.

- Length of sewerage system pipework. A fully decentralised sewer system will have a 'shorter' pipe network than a centralised system and as such, a lower rate of infiltration would be expected in a fully decentralised system.
- The type of sewer system implemented will affect the rate of infiltration. A 'low leakage' system has minimal opportunities for wet weather infiltration due to the minimisation of sewer man holes and joints in the pipe network.

As a result, consideration was given to the differing wet weather infiltration rates incurred from differing sewer servicing strategies should the site be serviced by either a lot by lot scale, in clusters or a centralised servicing system.

The assumed wet weather infiltration rate ranges that were adopted for each of the sewer servicing strategies were as follows over the course of the development (Stage 1 to Stage 4):

- Centralised: 1-2.53% rainfall;
- Cluster: 0.5-1.27% rainfall;
- Lot by Lot (fully decentralised): 0-1.27% rainfall.

1.2 Application of Adjusted Office Area to End Use Breakdown

Details regarding end use water demands as exhibited within a generic warehouse are found within the 'Water Balance Options Report, Part 1' (GHD, December 2007). The following outlines the implication of halving the equivalent population occupying each generic warehouse (now referred to as Generic Warehouse (27EP)) on the breakdown of end uses (due to a smaller office area).

A summary of the breakdown by end use within a generic warehouse is shown in Table 1. Column 'a' shows the end use breakdown assumed in the Generic Warehouse (55EP) and column 'b' shows the changing end use breakdown assumed when the generic warehouse is occupied by half the equivalent population (the Generic Warehouse (27EP)). Figure 2 shows the end use breakdown diagrammatically.

The total water demand required by the Generic Warehouse (27EP) is equivalent to that of 77% that of the Generic Warehouse (55EP). Of the total water demands, 72% are non-potable water demands within the Generic Warehouse (55EP), while 80% are non-potable water demands within the Generic Warehouse (27EP).

The reason for the increase in the portion of total water demands which are substitutable for non-potable water sources within the Generic Warehouse (27EP) is as follows;

» Unchanged garden size requiring the same volume of water for garden watering;

» Water demands as a result of end uses utilised per person such as amenities (etc) decreases. This results in an overall greater percentage of total water supply demand for watering (43% as opposed to the original 36%) which is serviceable by a non-potable water supply.

While there is greater potential for potable water reduction due to a greater portion of water demands being substituted with a non-potable water supply within the Generic Warehouse (27EP), the flow to sewer within the Generic Warehouse (27EP) is less than in the Generic Warehouse (55EP). In summary, 27% of total water demand flows to the sewer from the Generic Warehouse (27EP) as opposed to 39% from the Generic Warehouse (55EP).

Figure 2 a) and b) shows the proportion of total water demands from both the generic warehouse alternatives that may be potentially substituted by an alternative to potable water (purple colour or unshaded).

The proportion of total water demands from the Generic Warehouse (55EP) that could be serviced with a non-potable water supply equates to approximately 72% of the total water demands. The remaining 34% of the Generic Warehouse (55EP) water demand require a potable water supply. As such, maximising the substitution of end use demands that do not require a potable water source would result in a maximum achievable potable water saving in the order of 72% (See Figure 2(a)).

The proportion of total water demands within the Generic Warehouse (27EP) that could be serviced with a non-potable water supply equates to approximately 80% of the total water demands. The remaining 20% of the Generic Warehouse (27EP) water demand requires a potable water supply. As such, maximising the substitution of end use demands that do not require a potable water source would result in a maximum achievable potable water saving in the order of 80% (See Figure 2(b)).

Table 1 provides a detailed breakdown of end-uses for both the Generic Warehouse scenarios.

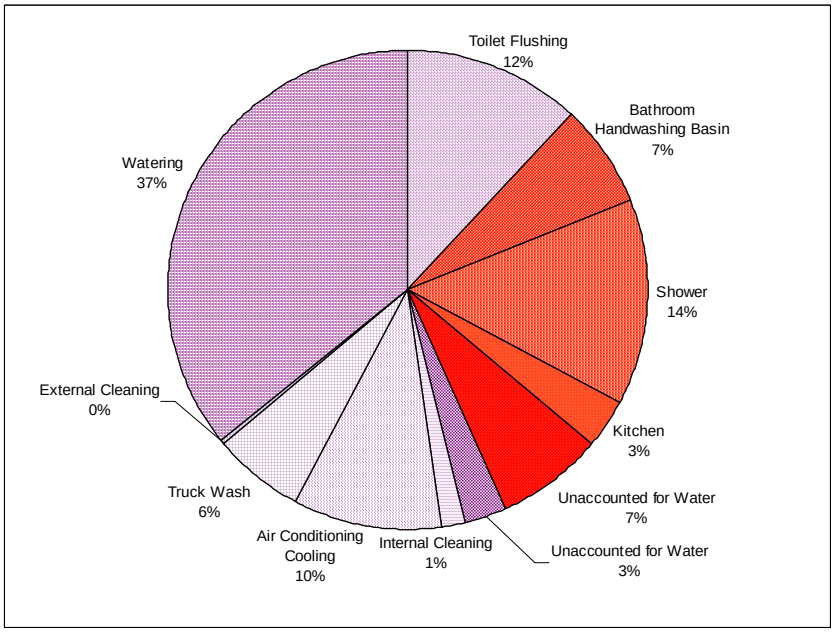
Table 1 Summary of Adopted End Use Assumptions within a 'Generic Warehouse' or Typical Tenancy

	(a) Assuming 55 EP per 'Generic Warehouse' (as a result of 10% office area)		(b) Assuming 27 EP per 'Generic Warehouse' (as a result of reduced [6%] office area)		
End Use (Water Demand)	**Water Demand (L/day for an Original 'Generic Warehouse')**	**Percentage of Total Original 'Generic Warehouse' Total Water Demand**	**Water Demand (L/day for a Revised 'Generic Warehouse')**	**Percentage of Total Revised 'Generic Warehouse' Total Water Demand**	**Assumptions**
Toilet and Urinal Flushing	586	12%	293	8%	Based on '3-star' toilet and urinal fittings.
Hand Basin Washing	348	7%	174	5%	Based on 3 uses of the handbasin per person/day for 15 seconds each time using a 3-star tap fitting (8.5 L/min).
Showering	698	14%	349	9%	20% of staff have showers each day for 8 minutes each time using a 3-star shower head (8L/min)
Kitchen (washing& drinking)	164	3%	82	2%	3 L / EP/ day
Air Conditioning Cooling	496	10%	384	10%	10% of total water consumption-of which 88% evaporates.
Unaccounted for Water	499	10%	384*	10%*	Unaccounted for water accounted for 10% of overall water demand in 2005 (SWC, 2005). * It has been assumed that "unaccounted for water" is equivalent to 10% of pressurised water demands. In reality this will be made up from a portion of both the potable and non-potable demands. This results in an overall "unaccounted for water" demand, except in the case where rainwater tanks are used to supplement end uses. In this case the total "unaccounted for water" demand will be less than 10%.

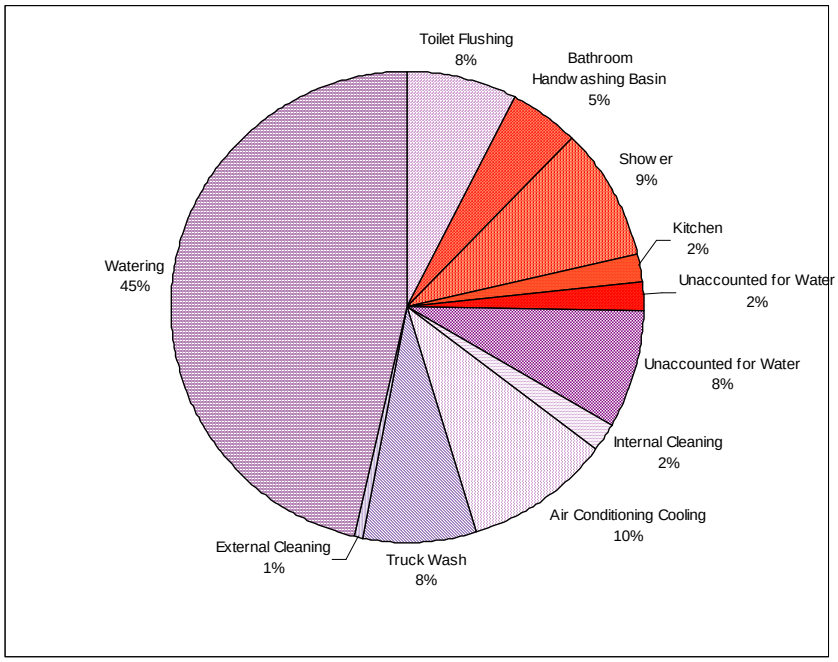
	(a) Assuming 55 EP per 'Generic Warehouse' (as a result of 10% office area)		(b) Assuming 27 EP per 'Generic Warehouse' (as a result of reduced [6%] office area)		
End Use (Water Demand)	**Water Demand (L/day for an Original 'Generic Warehouse')**	**Percentage of Total Original 'Generic Warehouse' Total Water Demand**	**Water Demand (L/day for a Revised 'Generic Warehouse')**	**Percentage of Total Revised 'Generic Warehouse' Total Water Demand**	**Assumptions**
Truck Wash	300	6%	300	8%	Based on two trucks being washed each day, requiring 150 L per wash.
Internal Cleaning	74	1.5%	74	1.9%	Based on the assumption that cleaning involves toilet flushing (8 toilet flushes- 24L) and mopping (5 buckets each 10 L- 50L).
External Cleaning	20	0.4%	20	0.5%	Assuming each bucket of water requiring for mopping contains 10 L, GHD assume that two buckets of water will be required each day for washing external surfaces.
Watering (Outdoor Garden use)	1,777	36%	1,777	43%	Using subsurface irrigation (and other water efficient watering methods)- the watering requiring during an 'average' rainfall year was assumed to be 0.88 mm/day (source unavailable).
Total (L/day/ 'Generic Warehouse' (or per 2.04 net hectares)	4,962 (of which 3528 or 71% is non potable demand)	100%	3,836 (of which 3081 or 80% is non potable demand)	100%	
Total (L/day/ net hectare)	2,432	-	1,880	-	
Flow to Sewer (L/day/ 'Generic Warehouse'	1,930	(39% of total water demand)	1,018	(27% of total water demand)	

Figure 2 Water Demand Breakdown by End Use within an each 'Generic Warehouse' (55EP and 27EP alternatives)

(a) 'Generic Warehouse' – (55EP)



(b) 'Generic Warehouse' – (27EP)



2. Modelled Scenarios

The Water Balance Report Part 1 (GHD, December 2007) concluded that scenario SP4 was the preferred scenario. SP4 consists of prioritising the utilisation of recycled blackwater for non-potable end uses before utilising roofwater run-off to service certain non potable end uses such as truck washing and toilet flushing.

GHD revisited this scenario to further reduce potable water consumption, while taking into consideration Goodman International Ltd's feedback which involved examination of a smaller office area and the effects of differing sewer servicing strategies on wet weather infiltration. GHD investigated the following revised scenarios for Stages 1 (initial) - Stage 4(completion) of the development namely:

A scenario recycling blackwater for all non-potable end uses and roofwater utilisation as required to substitute deficits in recycled water. It should be noted that the model scenario utilised a 70kL local rainwater tank (per generic warehouse) to service the watering requirements. This local rainwater tank was substituted by potable water as required. The remainder of the recycled water end uses (that is, all recycled water demands except watering) are substituted by potable water.

This scenario was modelled for both generic warehouse alternatives with differing infiltration rates (corresponding to potential servicing strategies) as follows:

- Centralised: 2.53% of rainfall (at completion – end of Stage 4);
- Cluster: 1.27% of rainfall (at completion – end of Stage 4);and
- Lot by Lot (fully decentralised): 0% of rainfall (at completion – end of Stage 4).

3. Results and Discussion

A summary table showing the modelling results for 'average' rainfall conditions is shown in Table 2 below.

3.1 Amended Scenario – looking at the effects of halving the EP per Generic Warehouse

The effects of halving the EP (from 55 EP to 27 EP) per /'generic warehouse facility' resulted in the following:

- A higher percentage of potable water savings, due to a larger proportion of non-potable end uses available;
- A larger deficit of recycled water due to the smaller proportion of flow to sewer, coupled with an increase in the proportion of recycled water demands;
- A slightly higher percentage of roofwater required to substitute the recycled water deficits (6.6% as compared to 7.0% of the Oakdale contribution to the Regional Roofwater Harvesting Scheme for 55 EP and 27 EP respectively during the 'average' rainfall year):

3.2 Amended Scenario- looking at the effects of varying wet weather infiltration

The amended scenario with 27 EP per Generic Warehouse was modelled for differing wet weather infiltration rates to compare its effect on the scenario. The following observations are made as wet weather infiltration rates decreased:

- The volume of recycled water available declines as with lower infiltration less blackwater is available for recycling. It should be noted that the volume of surplus recycled water that requires management was 0ML/year ('average' rainfall) with 0% rainfall wet weather infiltration (average rainfall) and up to 39.8ML/year (average rainfall) with 2.53% rainfall wet weather infiltration;
- The recycled water deficits (that require roofwater run-off substitution) increases as infiltration decreases due to less blackwater being available for recycling;
- The portion of rainwater from the Regional Roofwater Harvesting Scheme that is used for substituting deficits in recycled water increases with decreased infiltration;
- The volume of potable water required would ideally be the same irrespective of infiltration, as infiltration only affects non-potable demands. The exception is the case when both the recycled water and the roofwater require substitution by potable water. In this case, increased substitution of potable water would be required with decreased infiltration.

  In summary, decreased rates of wet weather rainfall infiltration are associated with a decentralisation of the servicing strategy. As the servicing strategy implemented becomes less centralised, lower infiltration rates would result in increased volumes of substituted roofwater run-off to meet greater recycled water deficits.

The modelling results show that between 6.8 -7.0% of Oakdale's contribution to the Regional Roofwater Harvesting Scheme water is utilised in the amended scenario with 27EP in an 'average rainfall year' (or 83-85ML/year at end of Stage 4). The utilisation of the available Scheme's water is slightly higher than

that incurred during the scenario with 55EP (that is, approximately 7.6% or 80.4 ML/year at Stage 4 within the 'average' rainfall year). The portion of Oakdale's contribution to the Regional Roofwater Harvesting Scheme utilised in the 55EP and 27 EP scenarios during a 'dry rainfall year' will increase to as much as 12%.

Table 2 Summary of Scenario Results (for 'Average' Rainfall Only)

SP 4 Amended Scenario Description	EP per Generic Proposed Warehouse	Proportion of Infiltration with respect to that Originally Assumed		Potable Saving (%)	Non-Potable Deficit / Substitution				Total Potable			Surplus Recycled Water				Rainwater Usage (for Raintank and Recycled Water Deficit)		
		Stage 1 (% of Rain)	Stage 4 (% of Rain)		Stage 1 (%)	Stage 1 (ML/pa)	Stage 4 (ML/pa)	Stage 4 (%)	%	Stage 1 (ML/pa)	Stage 4 (ML/pa)	Stage 1 (% of Flow to Sewer)	Stage 1 (ML/pa)	Stage 4 (ML/pa)	Stage 4 (% of Flow to Sewer)	%	Stage 1 (ML/pa)	Stage 4 (ML/pa)
Lots	27	0.0	0.0	70%	8%	2	17	9%	30%	7.8	56.5	0%	0.0	0.0	0%	7.0%	12.8	84.8
Cluster	27	0.5	1.27	71%	6%	2	17	9%	29%	7.8	56.2	13%	1.1	18.8	28%	6.8%	12.5	82.7
Centralised	27	1.0	2.53	71%	6%	2	17	9%	29%	7.8	56.2	24%	2.3	39.8	45%	6.8%	12.4	82.5
Lots	55	0.0	0.0	68%	3%	1	5.9	3%	32%	11.5	75.9			10.0	11%	6.6%	12.2	80.4
Cluster	55	0.5	1.27	68%	3%	1	5.9	3%	32%	11.5	75.9			31.3	28%	6.6%	12.2	80.4
Centralised	55	1.0	2.53	68%	3%	1	5.9	3%	32%	11.5	75.9	25%	4.1	52.4	40%	6.6%	12.2	80.4

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Appendix B

Water Balance Model Assumptions

Model Overview

The Water Balance Model allowed the evaluation of various water cycle management measures. The model was built to enable the provision of an integrated approach that could provide an appropriate quantification of various management resources on a daily time step.

The water balance assumes the following variables:

» **Rainfall**

The water balance is modelled for 'dry', 'wet' and 'average' rainfall conditions for each stage of each scenario.

The identification of 'dry', 'wet' and 'average' rainfall types are further discussed in Appendix B.

» **Wet weather infiltration**

Previous investigations conducted by GHD have identified gravity sewer modified with leak resistant designs as providing a simple sewage collection system to adequately meet the performance requirements.

The water balance assumes that all infiltration into the sewer occurs during 'wet weather' or during rainfall.

The infiltration rate during wet weather is estimated for impervious and pervious areas, in addition to the depth of rainfall which is required to fall on the various surfaces (pervious and impervious) before rainfall infiltration into the sewers is triggered.

A review was conducted of the 'Year 2004 STS Modelling Sewerage System Performance Summary Report- Year 2004 for Picton STS' which is a relatively new gravity (leak resistant modern) sewer system installed in 2000. The average rainfall ingress for all catchments within the Picton system were between 0-1.5% and the average rainfall ingress over a 10 year period for the system was 1.14%.

In addition, Sydney Water (2006) 'Appendix B: Calculating the Bubble Licence' suggest than an infiltration rate of 1% should be applied to modern (low leakage) sewerage systems. The adopted increase in rainfall infiltration is 0.1% each year due to system degradation.

The infiltration rate for impervious areas are assumed to have a similar rainfall ingress to that of pervious areas while the depth of rainfall required to trigger infiltration is higher. A 2mm rainfall infiltration trigger value is adopted for impervious areas of the development, whereas a 5mm infiltration trigger value is adopted for pervious areas.

The higher depth of rainfall lost to runoff on impervious surfaces, as compared to pervious areas results in larger infiltration trigger values in impervious areas.

It is assumed that development will progress at Stage 1 (approximately 2 years after receiving development approval) with a wet weather infiltration of 1% to which the wet weather infiltration will increase by 0.1% each year.

It is assumed that wet weather infiltration will be calculated for each stage of the development by incorporating a weighting factor for the cumulative wet weather infiltration associated with each area of the development at the particular developmental stage.

As such, the table below identifies the 'area weighted' wet weather infiltration adopted for each stage of the development:

Scenario Stage	Adopted Weighted Wet Weather Infiltration
Stage 1	1.0 %
Stage 2	1.03 %
Stage 3	1.08 %
Stage 4	2.53 %

» Pan Evaporation (including Pan Factor and Evaporation Factors)

Evaporation data was adopted as an average of three available sites located in the vicinity of the development being Prospect Dam, Richmond University- UWS Hawkesbury and Badgerys Creek. The daily mean evaporations for each month are as follows:

Month	Pan Evaporation (mm/d)
January	6
February	6
March	5
April	4
May	3
June	2
July	2
August	3
September	4
October	4
November	5
December	6

In general, the evaporation is relatively consistent across the three stations, ranging from the 2 mm / day in around June / July to 6 mm / day during December- February.

» Watering

The watering demand is operated on a two-store system, where ‘Store 1’ represents the topsoil and ‘Store 2’ represents the soil beneath. The pervious portion of each dwelling requires a watering application of 0.88 mm/day during the average rainfall year (,1.01 mm/day during the ‘dry’ year or 0.64 mm/day during the ‘wet’ year). When the moisture levels fall below 25% of the watering requirement, the pervious area of each ‘Generic Proposed Warehouse’ or tenancy receives water to achieve the watering application requirement to be determined on a daily basis. Evapotranspiration is assumed to occur from ‘Store 2’.

10% of the area of each ‘Generic Proposed Warehouse’ is assumed to comprise of pervious or irrigable area, this area is assumed to include any portion of associated road median strips in the area.

Currently, GHD are not aware of any areas of the development which are specifically allocated to public open space (that would require watering). As such, no watering has been allocated to public open space areas, although the water balance model does allow for this.

» Black and Greywater

In scenarios where blackwater is recycled, the volume of recycled water available for reuse is equivalent to 100% of the flow to the sewer each day (including wet weather infiltrated water).

Whereas, in scenarios where greywater is recycled, the volume of recycled (grey) water available for reuse is equivalent to 12% of the water used for air conditioning (the remainder is 'lost' to evaporation), shower water and the water used at the bathroom handbasin (in addition to 50% of the wet weather infiltration that infiltrates). It is assumes that the remainder of water (blackwater) is not available for reuse (toilet flushing, kitchen sink, cleaning and ½ of wet weather infiltration) and is expelled at the sewer, together with surplus greywater each day.

» Rainwater Tanks

A discussion of rainwater tanks is further expanded in Appendix D.

Appendix C

Rainfall

Rainfall Analysis and Data Selection

1. General

Available rainfall data was assessed in order to select year representative of a 'dry', 'wet' and 'average' year for use in the Water Balance.

Rainfall data was obtained from the Bureau of Meteorology (BOM). The rainfall data that was available in daily time steps from the BOM was selected from the following rainfall gauging stations:

Rainfall Gauge (Station ID)	Time Frame of Data Availability	Location of Rain Gauge with Reference to the Development Area
Horsley Park (67119)	1997-2006	Recorded within the development area or within 5 km east of the development
Minchinbury (67016)	1901-1970	Within 10 km north of the development
Badgerys Creek (67068)	1936-1996	Within 10 km west of the development

2. Rain Gauge Selection

The Horsley Park rainfall gauge appeared to be the closest to (or to potentially be located within) the development, however the data record was only available for the last nine years.

In addition, rainfall data from Minchinbury was compared to Badgerys Creek data for common dates, it was evident that Minchinbury rainfall data was similar to that of Badgerys Creek- and as such, only one of the data sets need be adopted.

As a result, the Horsley Park data set was compiled with the Badgerys Creek data set to produce a rainfall data set that extended from 1936 to 1996, with the exception of data from years 1975, 1983, 1994 and 1997. Data from years 1975, 1983, 1994 and 1997 was omitted either because it was only partially complete, deemed unreliable by the BOM or not available.

3. 'Average', 'Dry' and 'Wet' Rainfall Years Selection

The average annual rainfall year was calculated across the rainfall data set extending from 1936-1996 (Badgerys Creek) and 1997-2006 (Horsley Park)-omitting four years of rainfall data. The average annual rainfall for the data set was 779 mm (see table below).

The year which had a total annual rainfall closest to the average rainfall year was 1958, with an annual rainfall of 774mm.

The rainfall year with the minimum and maximum annual rainfall was 1944 (330 mm) and 1950 (1695 mm).

Therefore rainfall years 1958, 1944 and 1950 were adopted as the 'average', 'dry' and 'wet' years respectively- which all originated from the Badgerys Creek rainfall gauge (67068).

Rainfall Gauge Station	Year	Annual Rainfall (mm)
Badgerys Creek	1936	548.4
Badgerys Creek	1937	681.8
Badgerys Creek	1938	580.5
Badgerys Creek	1939	423.7
Badgerys Creek	1940	475.6
Badgerys Creek	1941	364.5
Badgerys Creek	1942	767.7
Badgerys Creek	1943	824.4
Badgerys Creek	1944	329.7
Badgerys Creek	1945	682.5
Badgerys Creek	1946	642.4
Badgerys Creek	1947	710
Badgerys Creek	1948	577.2
Badgerys Creek	1949	985.8
Badgerys Creek	1950	1695.2
Badgerys Creek	1951	852.5
Badgerys Creek	1952	949.7
Badgerys Creek	1953	525.3
Badgerys Creek	1954	671.2
Badgerys Creek	1955	989.5
Badgerys Creek	1956	1326.1
Badgerys Creek	1957	401.9
Badgerys Creek	1958	773.6
Badgerys Creek	1959	817.7
Badgerys Creek	1960	784
Badgerys Creek	1961	1033.5
Badgerys Creek	1962	1027.6
Badgerys Creek	1963	1508.5
Badgerys Creek	1964	694.8
Badgerys Creek	1965	428.7
Badgerys Creek	1966	702.9
Badgerys Creek	1967	925.6
Badgerys Creek	1968	565.2
Badgerys Creek	1969	1185.5
Badgerys Creek	1970	722.8
Badgerys Creek	1971	659.5

Rainfall Gauge Station	Year	Annual Rainfall (mm)
Badgerys Creek	1972	891.2
Badgerys Creek	1973	852.2
Badgerys Creek	1974	1044.4
Badgerys Creek	1975	
Badgerys Creek	1976	1051.3
Badgerys Creek	1977	608
Badgerys Creek	1978	1283.8
Badgerys Creek	1979	420.6
Badgerys Creek	1980	476.5
Badgerys Creek	1981	886.7
Badgerys Creek	1982	416.9
Badgerys Creek	1983	
Badgerys Creek	1984	983.4
Badgerys Creek	1985	750.4
Badgerys Creek	1986	911.8
Badgerys Creek	1987	876.9
Badgerys Creek	1988	1240.5
Badgerys Creek	1989	820.6
Badgerys Creek	1990	1124.2
Badgerys Creek	1991	736.8
Badgerys Creek	1992	922.6
Badgerys Creek	1993	491.2
Badgerys Creek	1994	
Badgerys Creek	1995	799
Badgerys Creek	1996	647.2
	1997	
Horsley Park	1998	962
Horsley Park	1999	1068
Horsley Park	2000	579.4
Horsley Park	2001	378.8
Horsley Park	2002	597.6
Horsley Park	2003	733.6
Horsley Park	2004	700.6
Horsley Park	2005	483.8
Horsley Park	2006	591.8

Appendix D

Water Demands- End Uses

4. Preamble

Water system demands are estimated based on planned water usage for the proposed development site using an end use model. The water demands are based on 'efficient' (generally a WELS rating of '3–stars') fixtures water usage and implementation of subsurface irrigation.

The analysis was undertaken considering that the development would be utilised for warehouse /office use.

5. Water Usage Analysis

5.1 Water Usage Demand Overview

The Water Supply Code of Australia 03-2002 v2.2 estimated water demands in light industrial and/or commercial developments to be 41 kL/hectare/day. In addition, Sydney Water Corporation conducted audits in a number of commercial buildings in Sydney and determined 'current best practice' water usage to equate to 22 kL/hectare of net lettable office space/day.

However, GHD experience in other projects such as the Eastern Creek Business Park, which have been developments of similar nature to that of the proposed Oakdale development site (i.e. predominantly light industrial in nature) have exhibited average water demands in the order of 2.3- 3 kL/ net hectare /day.

As such, GHD assume that adopting published data (by the Water Services Association of Australia and Sydney Water Cooperation) water demand values across the Oakdale development would significantly overestimate actual water demands, as published data and audits were undertaken in higher density developments and are applicable to generalised planning and design of trunk system infrastructure.

GHD have adopted an average water demand in the order of 2.3-3 kL/ net hectare/ day based on the assumption of adopting 27 EP /hectare from previous 'like' GHD project experience.

5.2 Water Usage Demands

GHD understand that the site will be developed by 'generic proposed warehouse facilities' which occupy on average 2 .04 net hectares each- of which 60 % of the total lot area is occupied by warehouse space and 5% of the total lot area is occupied by office space.

In addition to the warehouses land uses which will predominantly inhabit the site demanding water, a number of open space areas will occupy the site demanding water for irrigation.

GHD have identified the following water demanding end uses across the development:

- toilet and urinal flushing, hand basin washing, showering;
- kitchen (food preparation, washing), drinking;
- Air conditioning cooling;
- Internal Cleaning;
- Leaking water devices.
- Unaccounted for Water;
- Truck/Car wash;
- External cleaning; and
- Watering (outdoor garden use);

The basis for selection of water demands volumes by end use have been discussed individually below:

2.2.1 Toilet and Urinal flushing

Plumbing policies Australia-wise either require or encourage that for the installation of a new bathroom, a 6/3 L dual flush cistern or a proven authorized equivalent is installed. A 6/3L dual flush cistern corresponds to an average flush volume of 3.6 L[1], which equates to a WELS water usage rating of '3-stars' (water usage of between 3.5-4 L).

In addition, AS/NZS 3500.1 *Plumbing and drainage*, Part 1 specifies that a flush of more than 2.5L per single urinal stall is not allowed, as such GHD will adopt a urinal which utilises approximately 2 L per flush which is equivalent to a '3-star' rating (i.e. water usage not more than 2L/flush).

The 2001 *Census of Population and Housing (*Australian Bureau of Statistics*)* indicated that 63% and 37% of full time employees are male and female respectively.

GHD has assumed that each ET will visit the toilet three times a day, comprising of 2 part flushes and 1 full flush. GHD assume that all males (assumed to be 37% of the working population) will use the urinal for partial flushes.

2.2.2 Hand Washing Basin

SWC encourage the usage of a minimum '3-star' rating of tap, using between 7.5-9 L/min, in addition SWC distributes flow aerators for taps that equate to a flow of 9L/min. However, taps are available with flows down to 4.5 L/min (and potentially lower flows).

GHD will adopt an 'efficient' tap flow rate of 8.5 L/min- equivalent to a '3-star' water rating.

GHD will assume that the hand washing basin will be used by each equivalent tenement each time the toilet or urinal is visited. GHD assume that each use of the hand washing basin will be carried out for approximately 15 seconds.

2.2.3 Showering

The most efficient shower head 'star' rating currently specified by WELS is a '3-star' water rating, equating to a water usage of between 7.5-9 L/min. WELS are currently undertaking 'comfort tests to ensure that flow rates less than 7.5L/min perform effectively and are acceptable to consumers'.

GHD has adopted a shower head which equates to a water usage of 8L/min- equivalent to a '3-star' water rating.

Sydney Water Corporation End Use analysis (SWC, 2006) indicates that within a residential setting, the average shower frequency is 0.8 showers per capita per day with an average duration of 7.3 minutes for each shower.

GHD has adopted a similar average shower duration for showers taken within the development (warehouse/office) setting, that is a duration of 8 minutes / shower. In addition, GHD have assumed that as 0.8 showers per capita per day take place within a residential environment, the remaining 20% of the population shower within the workplace (assuming that on average each person showers once a day). As such, GHD will assume that within the development, 20% of employees shower within the workplace each day, for a duration of 8 minutes with an average shower flow rate of 8L/min.

2.2.4 Kitchen – Food Preparation, Washing and Drinking

[1] The average water consumption for a dual flush toilet is calculated as the average of one full flush and four reduced flushes.

GHD have assumed that the taps installed within the kitchen will be similar to that installed within the bathroom basins, that is utilise 8.5L/minute (equivalent to a '3-star' water rating).

GHD assume that each equivalent tenement will demand 2L/day for food preparation or washing in the kitchen, in addition to 1L/day for drinking. As such, the total water demand adopted in the kitchen will be equivalent to 3L/day per equivalent tenement in the development.

2.2.5 Air Conditioning Cooling

Sydney Water's publication '*Save Water, Money and the Environment*' has stated that air conditioning consumes between 10-25% of a commercial buildings total water usage. However, traditionally warehouse or light industrial land uses demand lower extents of air conditioning which compared to commercial land uses.

It is assumed that only the office areas of each development will be air conditioned and as such only 10% of each generic lot area will demand water for air conditioning cooling. As such, GHD have adopted that only 10% of the developments total water usage will be demanded by air conditioning cooling end use.

In addition, Sydney Water's publication 'Water Conservation- Best Practice Guidelines for Cooling Towers in Commercial Buildings' have stated that water demand in cooling towers comprises of that shown in the table below. As such, GHD will assume that of the total portion of water demanded for air conditioning cooling, 88% of the water will be lost to evaporation- the remainder (12%) of which will travel to the sewer or be available for recycling (as appropriate). This hypothesis assumes that the air conditioning cooling systems installed in the development will manage the potential for 'bleed, drift, slash and overflow' to occur to equate these demands to negligible requirements (therefore, not considered).

Table: Air Conditioning Water Usage Make Up (Sydney Water Corporation)

Air Conditioning Process	Demand Per Process as a Portion of Total Air Conditioning Water Demand (%)	Description
Evaporation	88%	Part of the water cooling process.
Bleed	5%	To prevent build up of dissolved and suspended solids from evaporated portion of water. Generally the bleed valve transports the 'bleed' water to sewer
Drift and Splash	7%	Drift- Water lost from the cooling process as liquids entrained in the exhaust air. Splash- Water accidentally emitted due to splashing (by strong wind, falling water etc). GHD assume that the water losses to drift and splash will be negligible within the developments air conditioning system due to adequate design.

Overflow	Overflow occurs when the water level within the air conditioning system basin rises above a predetermined design level. Traditionally, this 'overflow' water travels to sewer and can account for up to 40% of daily water demands. However, GHD have assumed that the air conditioning cooling systems will have adequately designed systems, and therefore 'overflow' has not been considered or accounted for with the water demands.

2.2.6 Internal Cleaning

It is assumed that each 'generic proposed warehouse facility' comprises of four bathrooms (2 male and 2 female bathrooms, each bathroom containing two toilets and two sinks). GHD additionally assume that each 'generic proposed warehouse facility' contains one kitchen area.

As such, it is assumed that cleaning of the bathroom and kitchen facilities takes place on a daily basis via:

» Flushing each toilet each day (part flush) within each bathroom- equivalent to eight toilets (part flushes);

» Mopping (assume this incorporates cleaning in the kitchen sink) – assume each of the four bathrooms and the one kitchen, that is five separate rooms gets cleaned each day with one bucket of water (for mopping) once a day. Assume that each bucket of water utilises 10 L of water.

Therefore, GHD have assumed that the total daily water usage for internal cleaning is 74 L/day within each 'generic proposed warehouse facility'.

2.2.7 Leaking Water Devices

The Department of Planning have estimated that the current average portion of water that is attributed to leaking devices or fittings is 0.7% of total water consumption within a residential water setting. While this data is representative of residential settings only, GHD have assumed that the development will water fittings will be efficient, installed corrected and maintained appropriately – and as a result water demand due to leaking devices will be minimal and therefore is considered to be negligible (and disregarded).

2.2.8 Unaccounted for Water

Unaccounted for water is the difference between potable water release from the storage reservoir and the water supplied to customers. The SWC annual report 2005 indicated that 10% of overall water demand (currently potable water demand) was unaccounted for water.

Similarly, GHD has adopted that 10% of total potable water demand is unaccounted for water demand in the Oakdale Development Site. In addition, GHD have assumed that a further 10% of overall recycled (black or grey) water will result in unaccounted for water being an additional pressurised system.

It should be noted that unaccounted for water is a water demand that does not enter the sewer, it is assumed to be "lost" to the groundwater table or other.

2.2.9 Truck and Car Wash

Car washing in Sydney is currently only permitted if conducted using a bucket, that is, the use of hoses for car washing is illegal using potable water. As such, it has been assumed for the purposes of this study and estimating water usage of cars/trucks- should potable was be required for vehicle washing, a bucket, and therefore minimal water will be utilised.

It is assumed that a hose will be used for vehicle washing purposes in the warehouse/office environment. In addition it is assumed that an alternative source to potable water will be used for vehicle washing (either recycled, rainwater or greywater) and as a result car washing would be permissible.

A truck washing quote was obtained from 'Wash N Go'. 'Wash N Go' run a mobile truck wash service which includes the supply of the initial 1000L of water in a tank, which they envisage being fit to wash approximately 6-7 'average sized delivery' trucks. 'Wash N Go' estimate a wash time of 10-15 minutes per truck. Based on the 'Wash N Go' quote, an 'average sized delivery truck' would require approximately 166 L per car wash.

It is assumed that an average tap flow rate of 8.5 L/min is adopted (see Bathroom tap assumptions) at the development and an average truck wash time of 15 minutes (from 'Wash N Go'). GHD have roughly calculated that a truck would require 128 L of water per wash.

As it has been estimated the volume of water required to wash each truck ranging between 128 and 166 L of water, the average truck wash water demand of 150 L / wash has been adopted.

It is assumed that on average two trucks get washed each day within each proposed warehouse facility lot. Therefore, it is assumed that 300 L/day is required for vehicle washing in each development lot.

In addition, it is assumed that the water utilised for truck washing is not recycled as black or greywater – however is captured by stormwater drains or other.

2.2.10 External Cleaning

It is assumed that two buckets of water will be utilised for external (mopping or otherwise) purposes externally. It is assumed that each bucket of water contains 10L (as per internal cleaning).

2.2.11 Watering (Outdoor)

It is assumed that watering will only be conducted via subsurface irrigation techniques across the development area.

In a study conducted by an unavailable source (2006), water usage data was collected from 2000 residential dwellings across five geographic/climatic zones across Sydney. The results of the research suggest that the residential watering requirements do not take into account the absolute value of rainfall received by the garden. Although, with a combination of increased education leading to behavioural changes and installation of fixed irrigation system (for instance subsurface irrigation) for the Cumberland Plain Zone can be lowered to an efficient water demand of 0.87 mm / m2/ day. As such, GHD have adopted a similar (0.87mm/day) irrigation requirement within the industrial development at Oakdale (despite this being a industrial development and not residential in nature).

Appendix E

Rainwater Tanks

1. General

Various scenarios incorporated the use of rainwater tanks into the servicing strategy. The use of rain water collected in rainwater tanks from runoff on the roofs of the warehouse dwellings provides a valuable alternative to potable water for a variety of non potable end uses, such as vehicle washing, air conditioning cooling, toilet flushing and watering.

A rainwater tank model was constructed to simulate the rainwater tank operations and select the optimal rainwater tank size, in doing so, the following considerations were made:

» Rainfall received;

» Roof area or runoff area;

» Roof Wetting;

» First Flush; and

» Rainwater demands (by end use).

2. Rainwater Tank Model Assumptions

The rainwater tank model assumptions built into the scenarios assumed the following:

» Rainfall received

The rainfall runoff that could potentially be captured by the rainfall tank from the roof of each dwelling was simulated individually for the 'dry', 'wet' and 'average' rainfall year (see Appendix B) within each scenario run.

» Roof Size

It is assumed that 100% of the roof area of each proposed 'Generic Warehouse Facility' is utilised as area in which rainfall runoff occurs. This assumption is justified as that it is envisaged that when designing new dwellings, the gutters will be designed to maximise roof area capture of rainfall runoff.

» Roof Wetting, First Flush Diversions and Overflow

While it is assumed that rainfall runoff has the potential to runoff 100% of the area of the roof into the rainwater tank, the proportion of rainfall that actually reaches to rainwater tank is affected by three factors:

-It is assumed that the initial 2mm of rainfall that falls on the roof is considered 'wetting', that is, potential rainfall runoff that is not captured by the rainwater tank, but is rather 'lost runoff' as evaporation or other;

-To prevent sediment and other pollutants entering the rainwater tank, a portion of the initial runoff from the roof is transferred to stormwater, this is known as the 'first flush'. The portion of water diverted as part of the first flush differs for each dwelling depending on the amount of pollution each roof is susceptible to. According to Rainwater Harvesting Pty Ltd the minimum first flush should be in the order of 0.2L/m^2 of roof, ranging up to 2L/m^2 for roofs located in heavily polluted areas. Literature suggests that the recommended first flushes range from 5L to 1-2mm of runoff (Yaziz et al 1989, Coombes et al, 2000, Cunliffe 2004, Zobrist et al, 2000). While the ideal volume of first flush to be diverted from a roof is unresolved (Gardner, Bausden and Millar, 2004), it has been reported that the highest soluble metal concentration occurs in the initial 0.1-0.25mm of roof runoff (Quek and Forster 1993, Zobrist et al, 2000). Gardner, Bausden and Millar (2004) recommend a first flush depth of 0.5-1mm.

As the development is located in a predominantly light industrial area, where there may be potential for some roof pollution, a standard first flush volume of 1mm of runoff from across the roof area has been adopted.

-Any roof runoff that exceeds the rainwater tank capacity is 'overflow', and in line with the Regional Roofwater Harvesting Scheme', is stored in temporary detention tanks prior to pumping into the regional collection system for transport at Prospect Reservoir. 'Overflow' water is therefore rainfall runoff water that is not utilised by the development.

3. Rainwater Tank Modelling

3.1 General

The scope of the 'Regional Roofwater Harvesting Scheme' assumes that all rainwater (up to 44mm per day) will be harvested from the roofs of all generic warehouse in the development and pumped to prospect reservoir. Therefore, rainfall harvested from the roofs of dwellings in the development will not be available for use by the development. However, preliminary analysis of scenarios run solely with recycling (of either grey or blackwater) for non potable end use demands results in an overall deficit of recycled water supply, resulting in recycled water demands being substituted by potable water. As a result, GHD have simulated a scenario whereby rainwater is utilised to supply water demands for several (and varying combinations) of end uses.

In addition, preliminary analysis in simulating the use of rainwater tanks to capture all rainfall in excess of 44mm /day was conducted, however the benefits of such as scheme were minimal (and the health consequences from runoff seldom running into the tank was detrimental to the scheme). As such, the simulation of this servicing strategy scenario was omitted during early model runs.

As a result, GHD conducted an 'isolated' (omitting the wider Water Balance model) simulation of the potable water substitution of differing rainwater tank sizes when servicing differing end uses (limited to one or a combination of toilet flushing, car washing or/and air conditioning cooling). As this simulation was only a preliminary analysis, the graphs below only represent 'average' rainfall conditions.

3.2 Rainwater Tank Modelling Results

The use of a rainwater tank was simulated for 'average' rainfall conditions to service three differing combinations of end uses for each 'Generic Warehouse Facility' being:

- Toilet Flushing water demands only;
- Toilet Flushing and Truck Washing water demands; and
- Toilet Flushing, Truck Washing and Air Conditioning Cooling Water demands.

The potable substitution of rainwater required as a percentage of the total ideal rainwater demand was assessed for these differing rainwater end use demands, the results of which are shown in Figure 1 (below). GHD nominally adopted a rainwater tank volume which resulted in an 'acceptable' (generally less than 20%) proportion of ideal rainwater demand being substituted by potable water to meet the demands of the selected end use. This generally resulted in rainwater tanks being selected between a range of 15-30 kL depending on the end uses the rainwater tank was servicing.

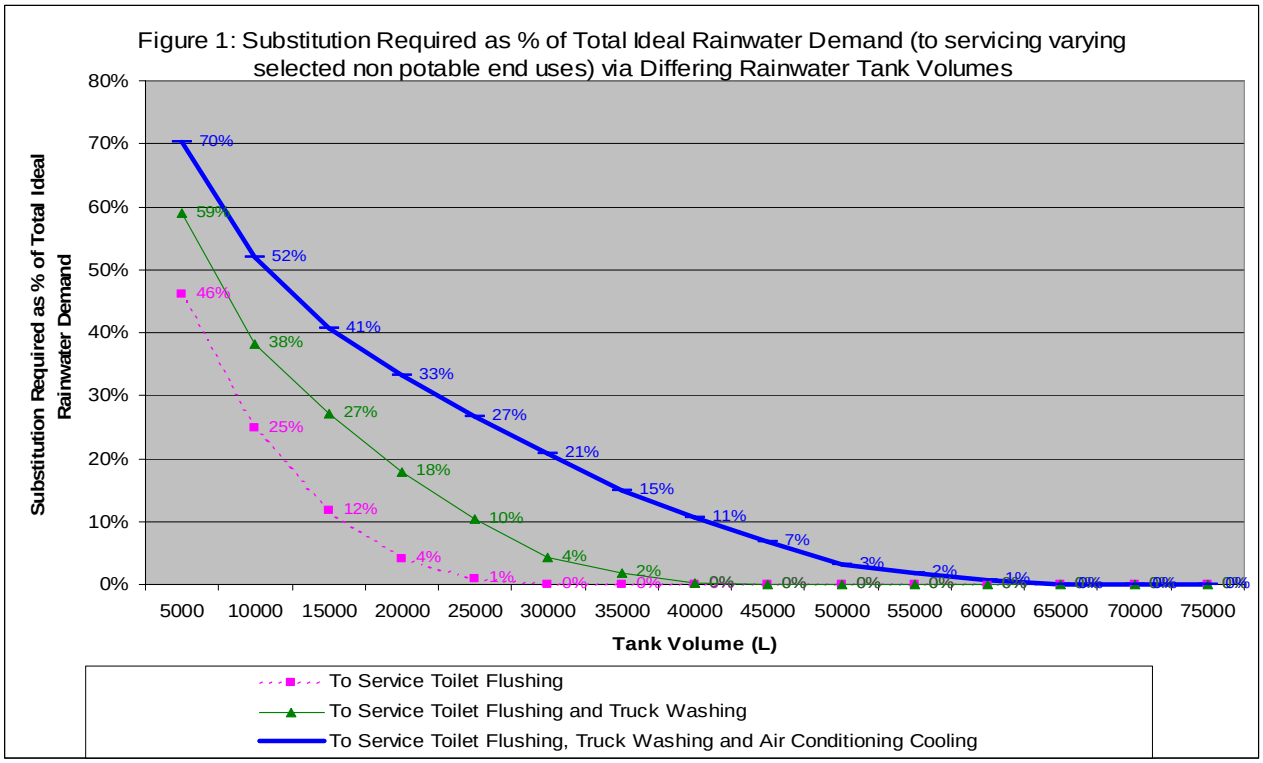
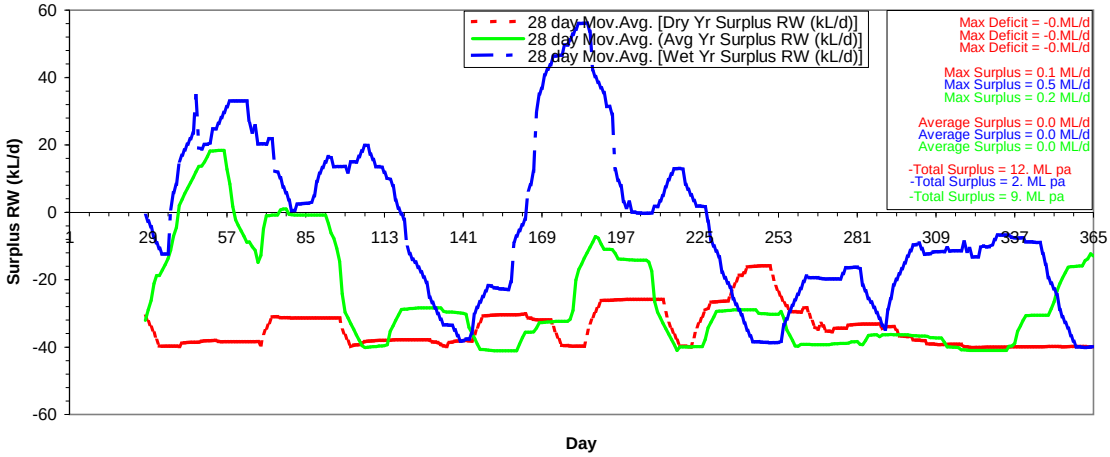


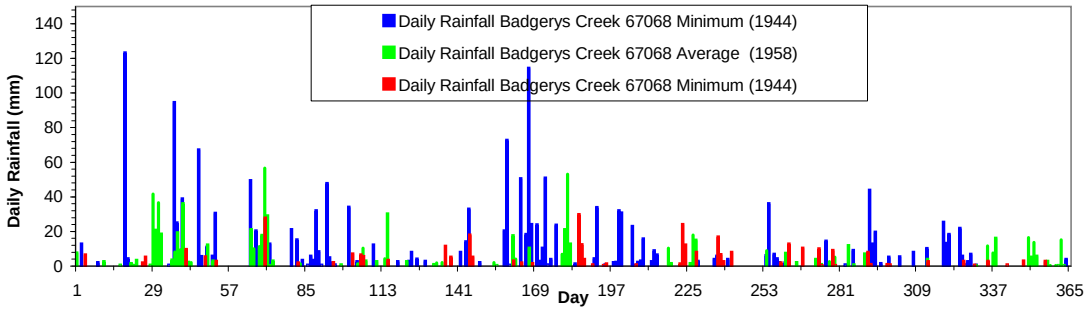
Figure 1: Substitution Required as % of Total Ideal Rainwater Demand (to servicing varying selected non potable end uses) via Differing Rainwater Tank Volumes
Substitution Required as % of Total Ideal Rainwater Demand
80%
70%
60%
50%
40%
30%
20%
10%
0%
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
65000
70000
75000
Tank Volume (L)
To Service Toilet Flushing
To Service Toilet Flushing and Truck Washing
To Service Toilet Flushing, Truck Washing and Air Conditioning Cooling

Appendix F

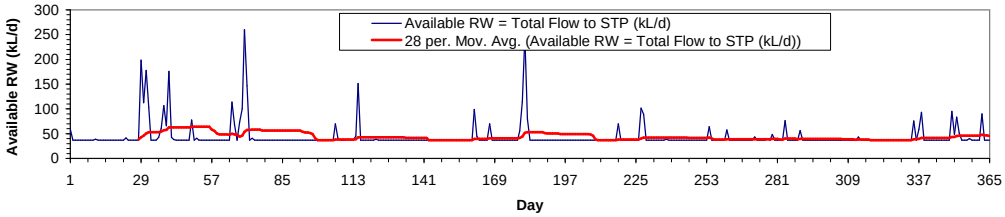
Water Balance – Detailed Graphical Output

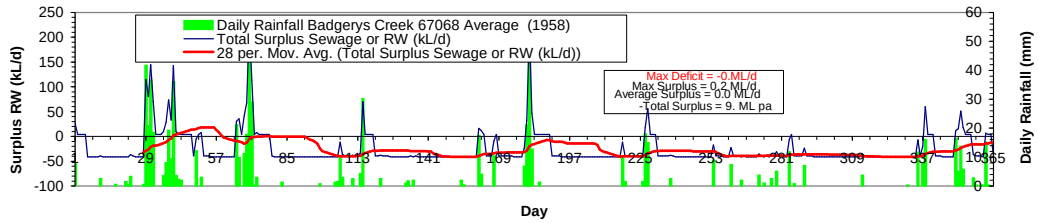
Scenario 1 - Stage 1

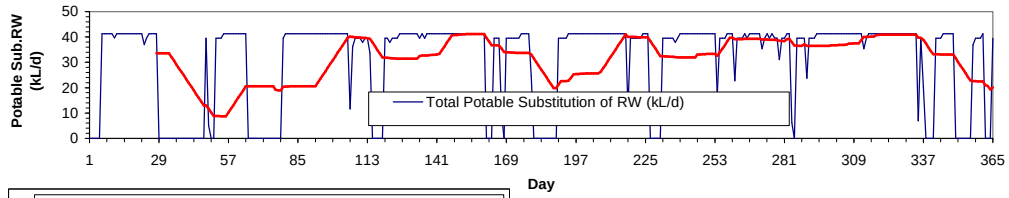


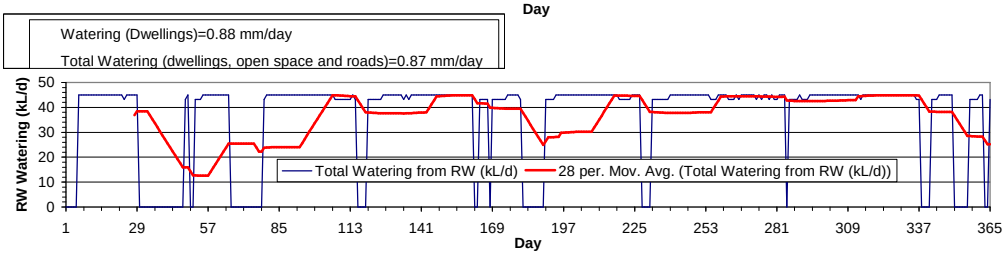


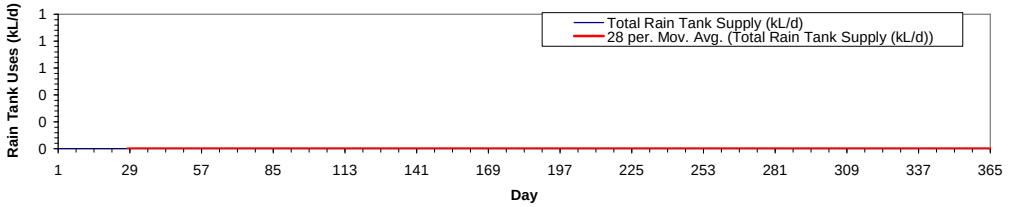
Scenario 1 - Stage 1- Average Rainfall Year

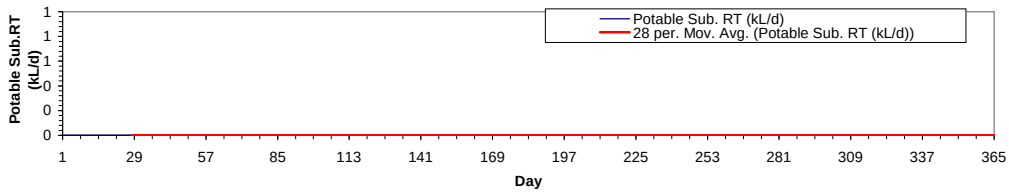


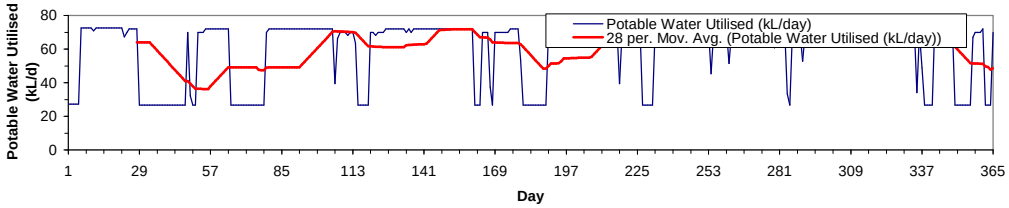


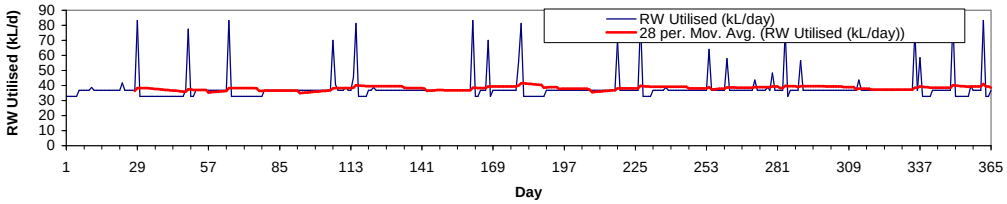




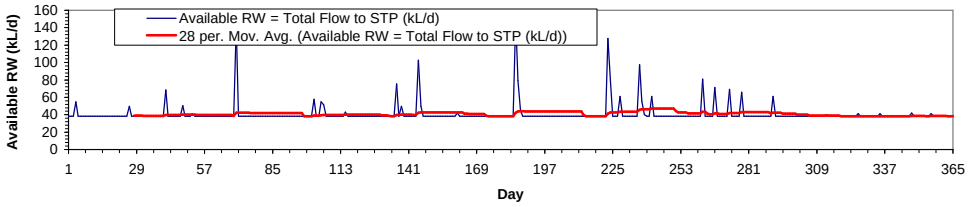


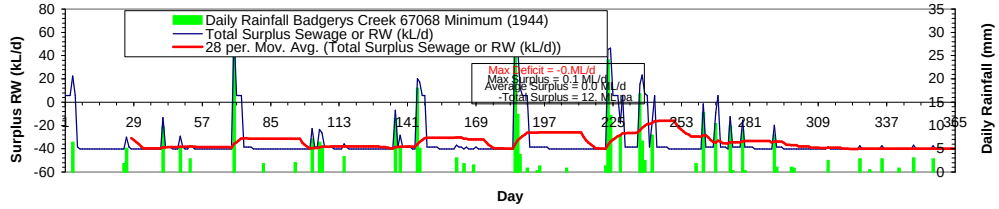


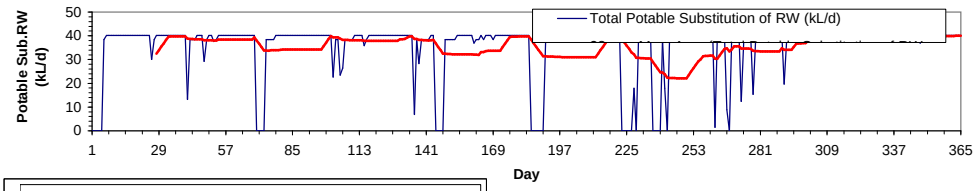


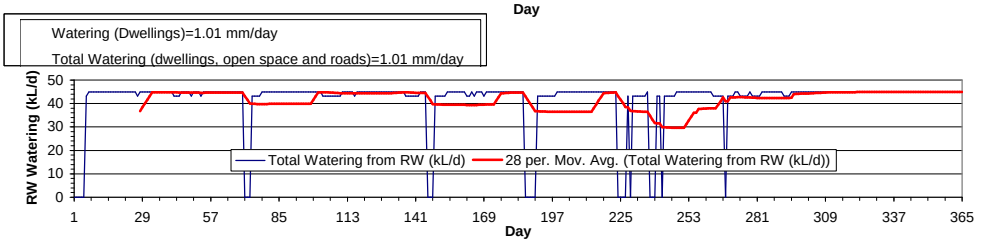


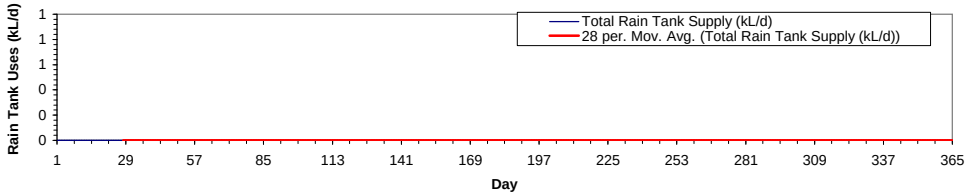
Scenario 1 - Stage 1- Dry Rainfall Year

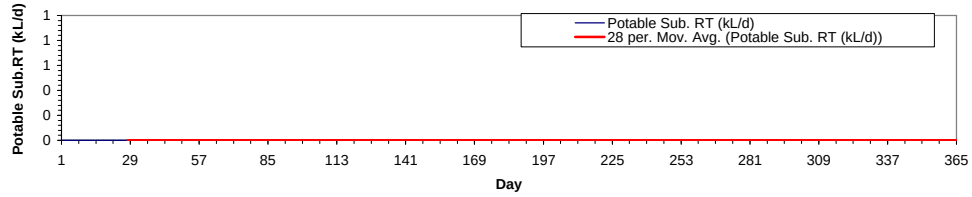


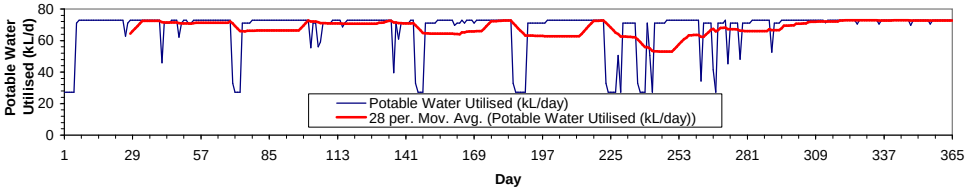


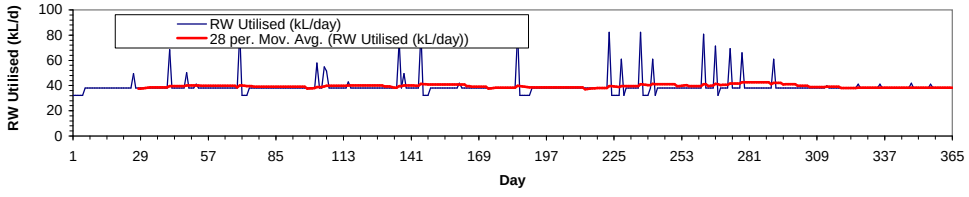




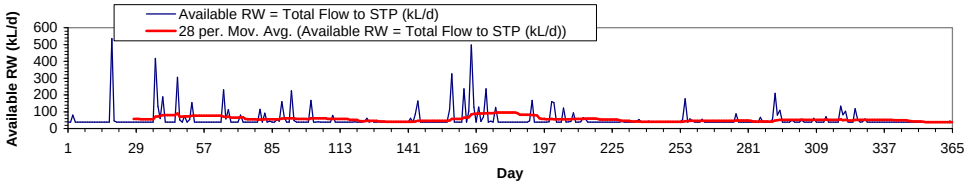


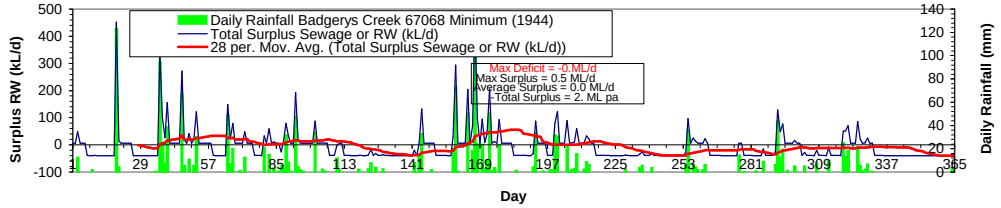


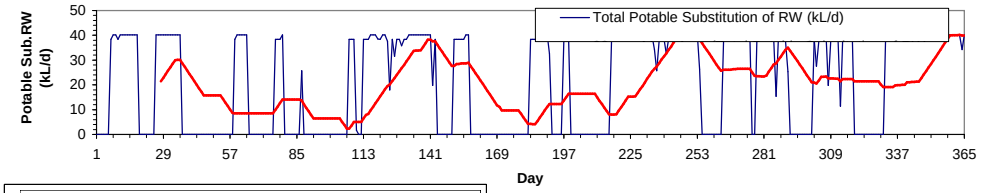


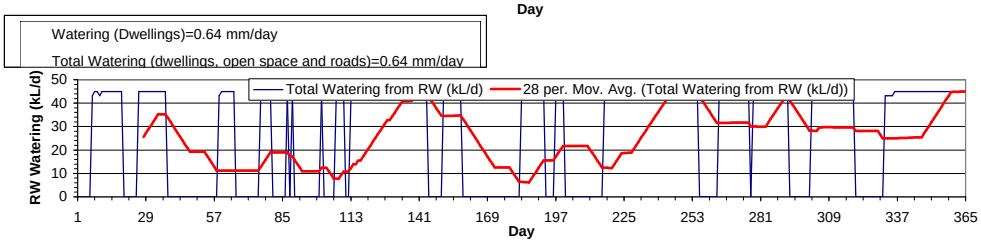


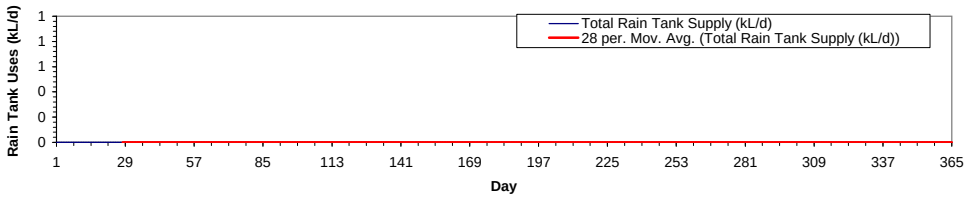
Scenario 1 - Stage 1- Wet Rainfall Year

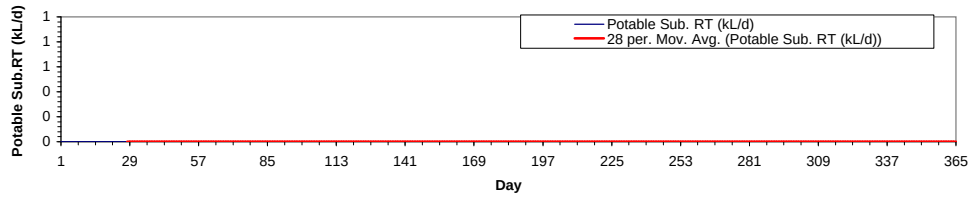


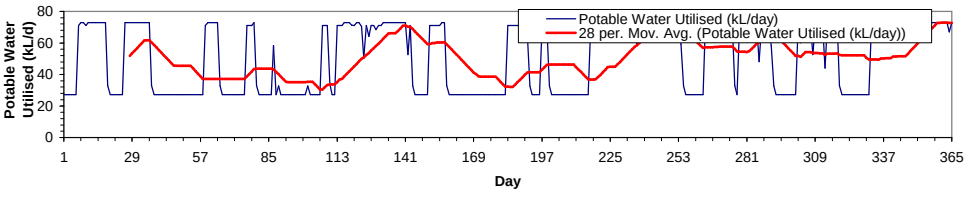


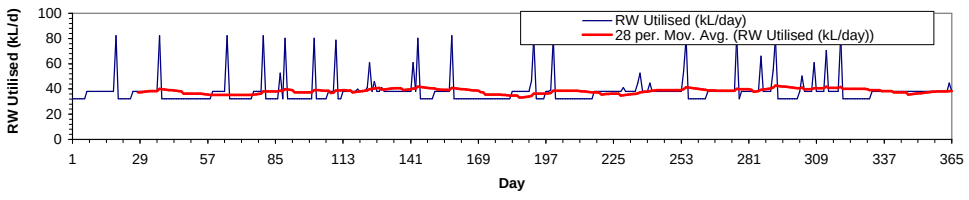




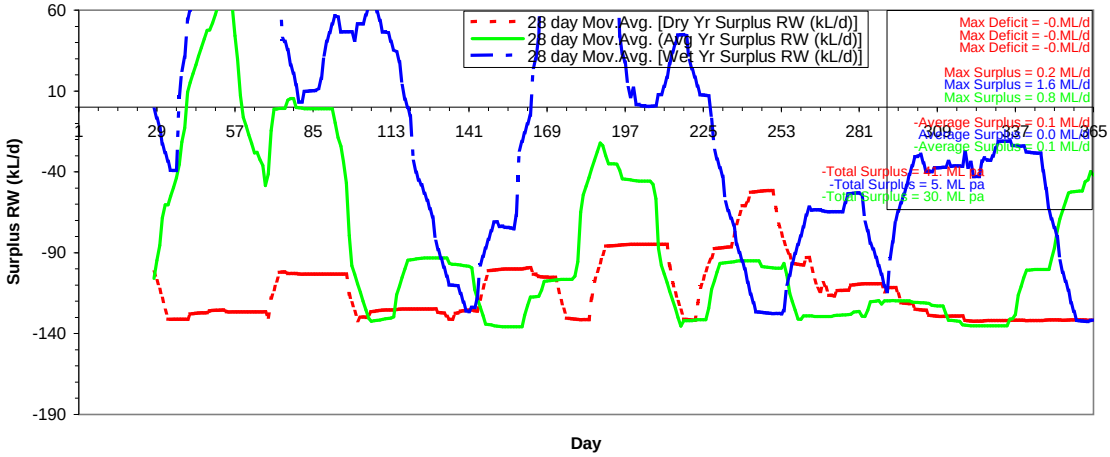


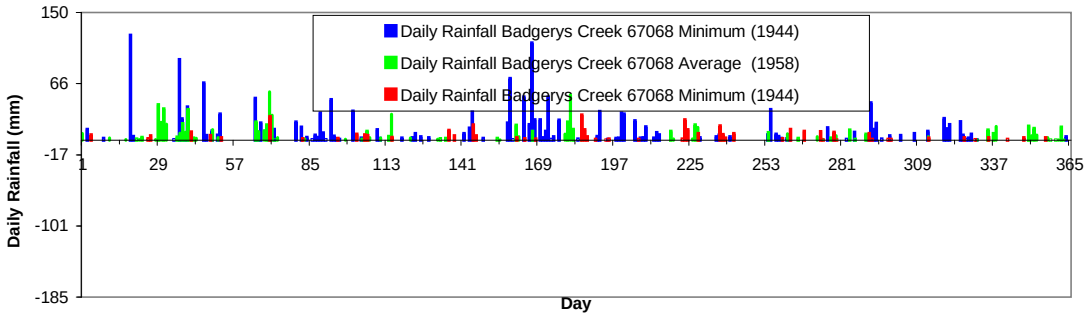




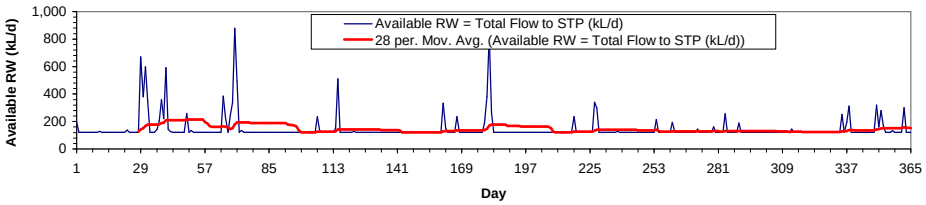


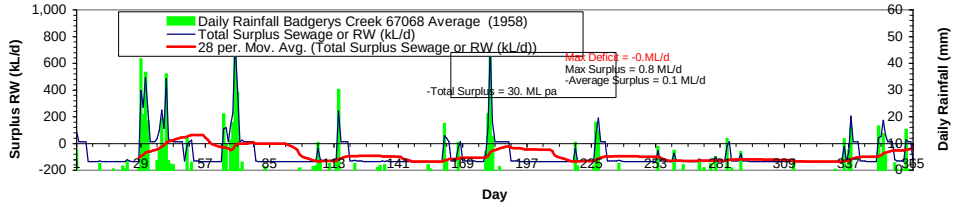
Scenario 1 - Stage 2

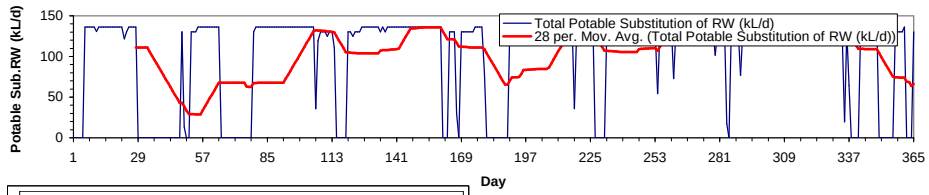


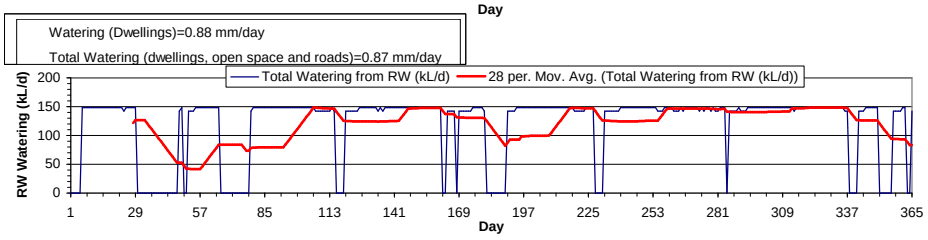


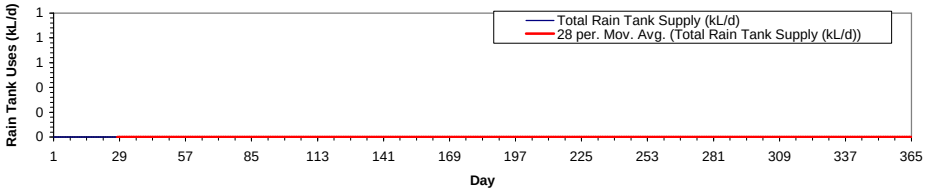
Scenario 1 - Stage 2 - Average Rainfall Year

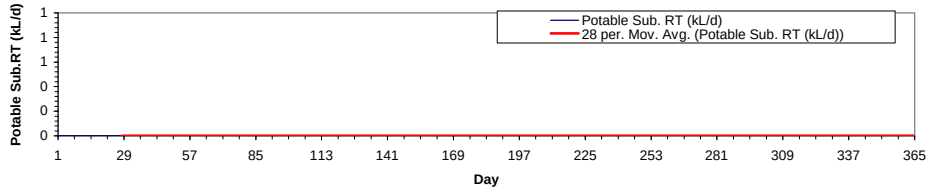


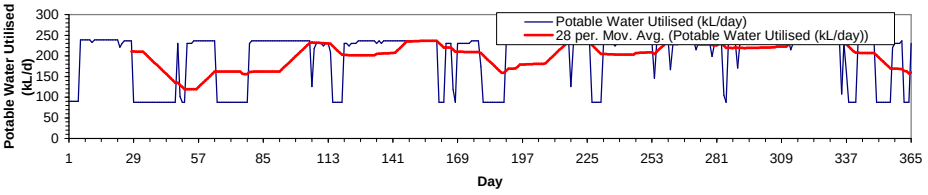


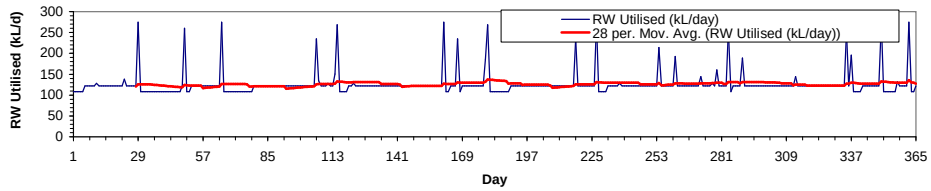




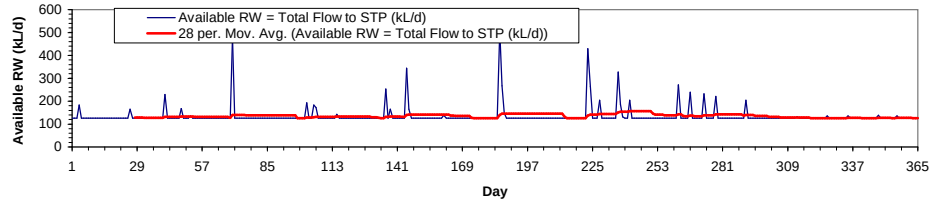


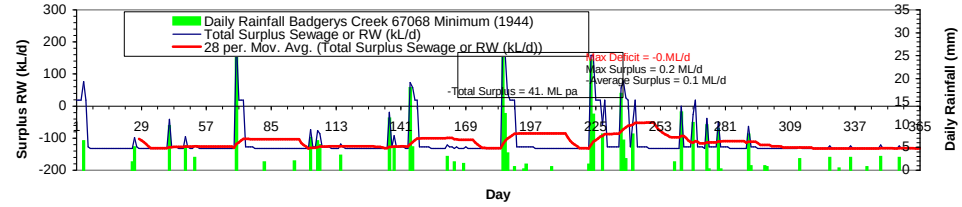


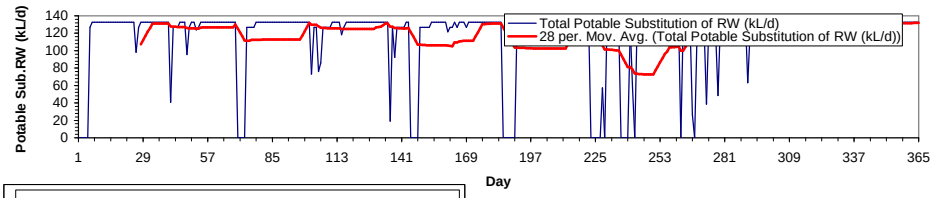


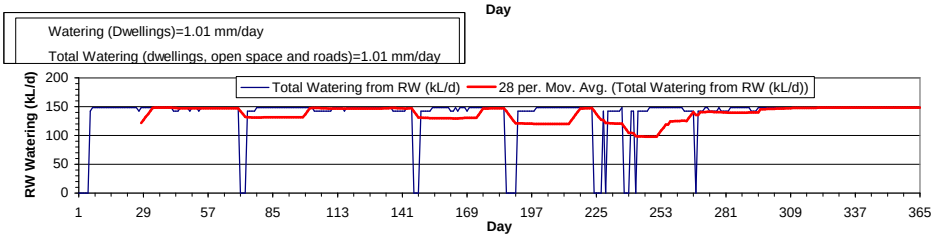


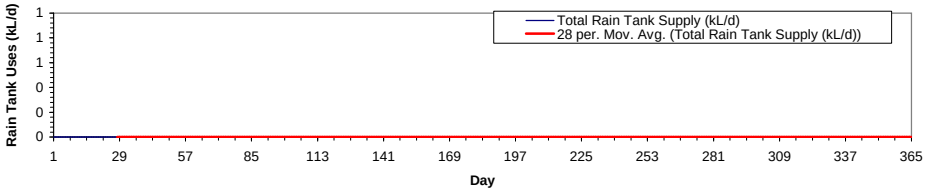
Scenario 1 - Stage 2 - Dry Rainfall Year

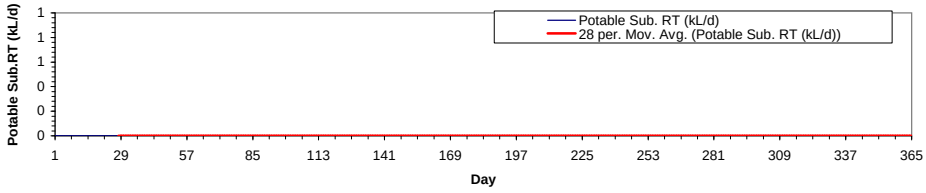


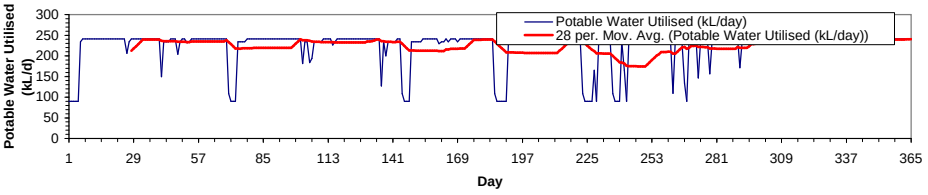


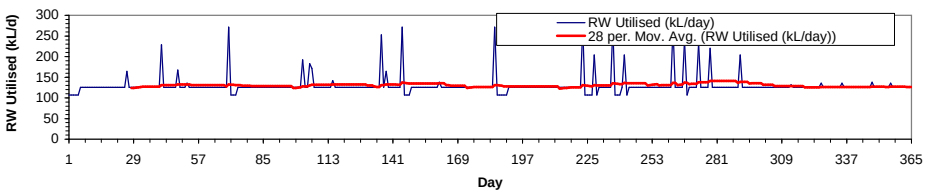




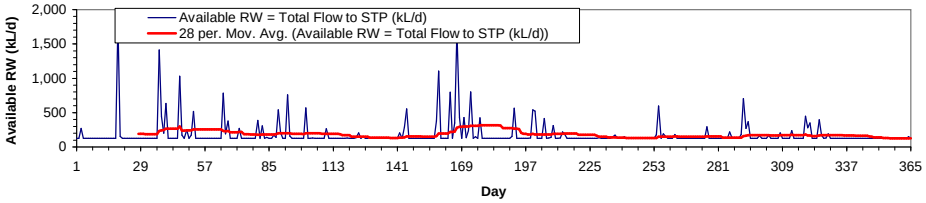


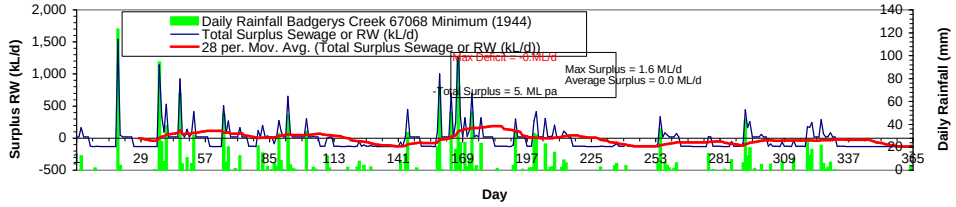


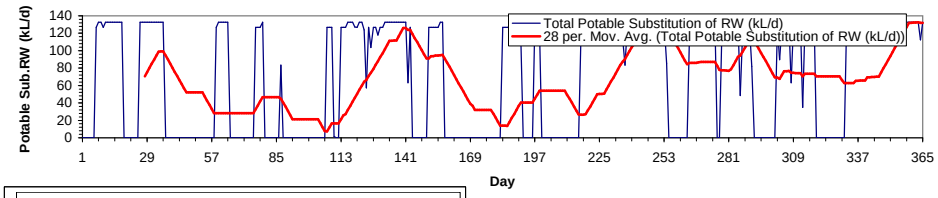


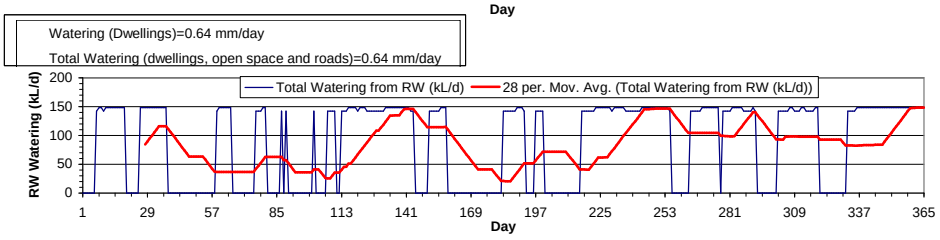


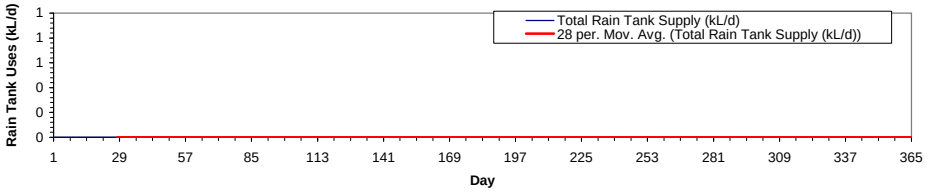
Scenario 1 - Stage 2 - Wet Rainfall Year

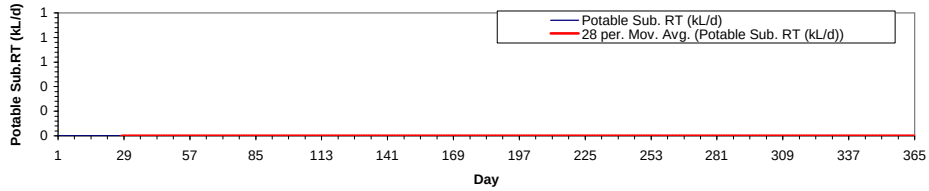


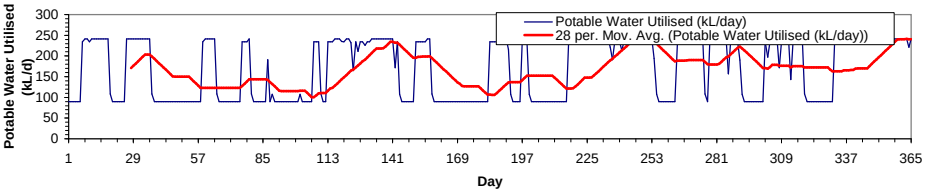


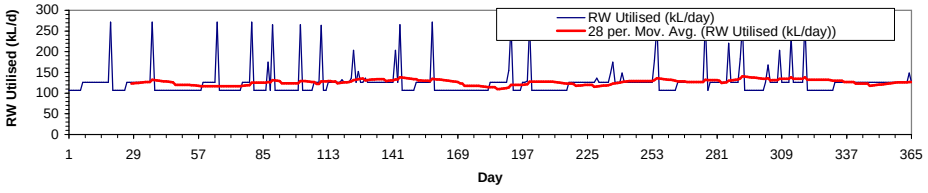




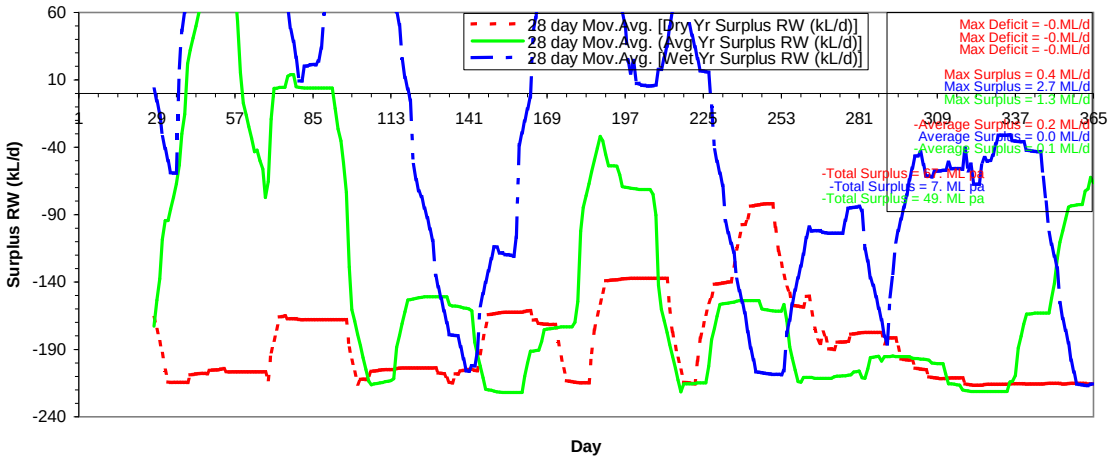


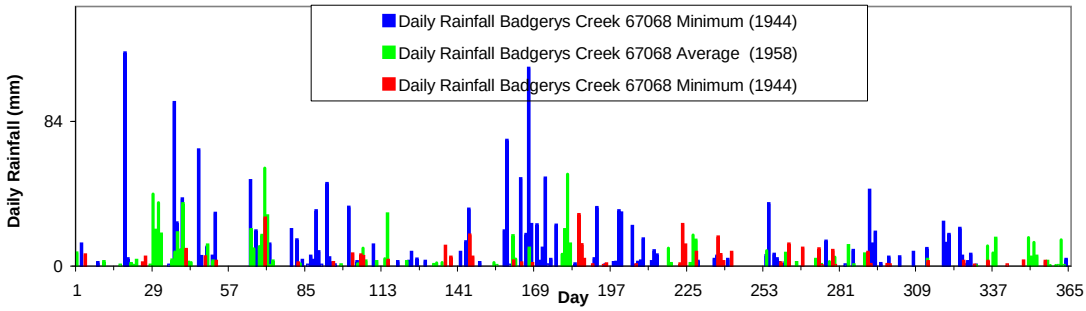




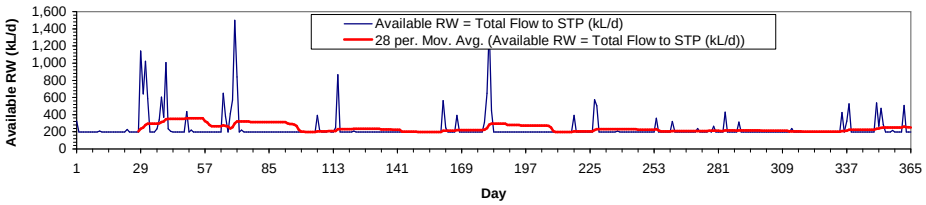


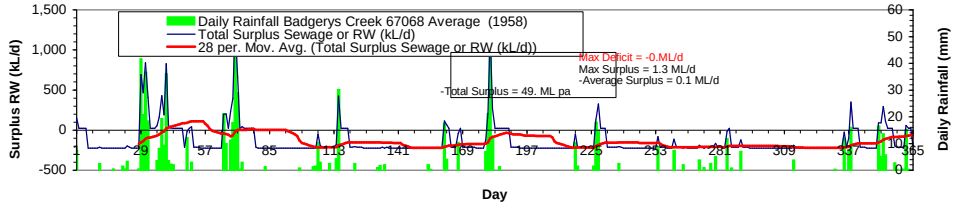
Scenario 1 - Stage 3

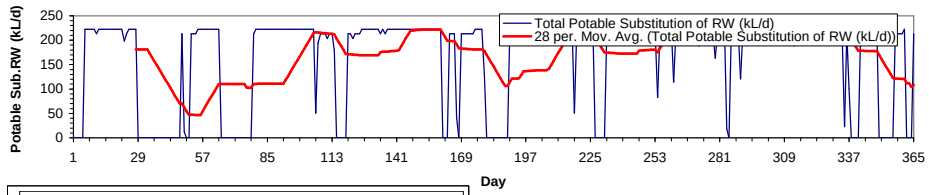


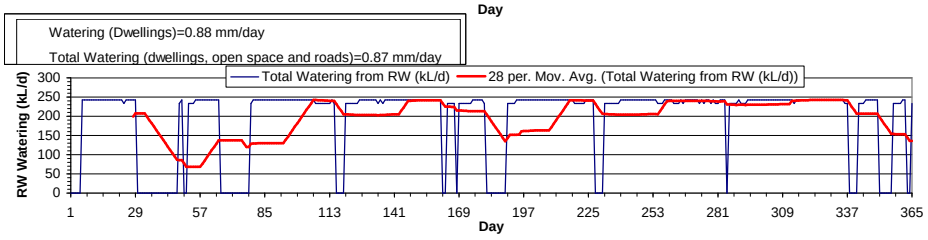


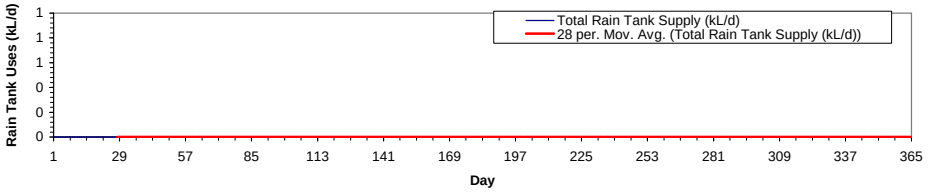
Scenario 1 - Stage 3- Average Rainfall Year

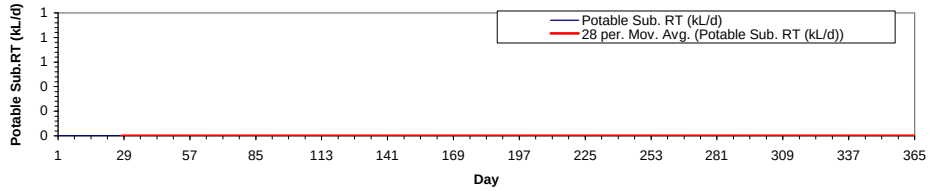


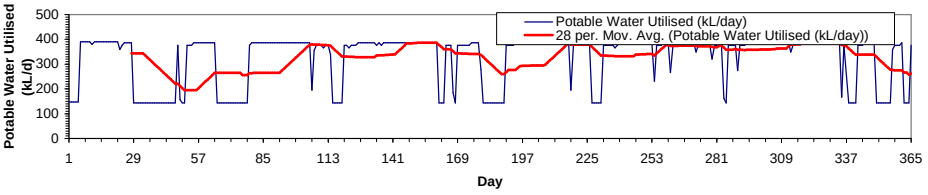


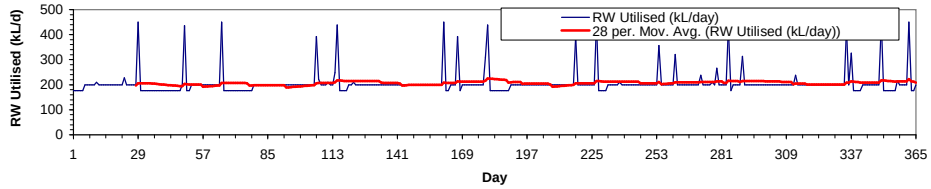




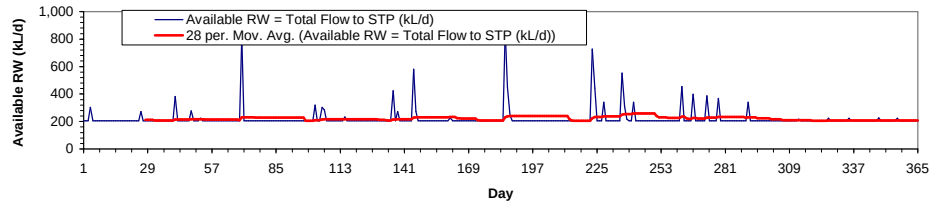


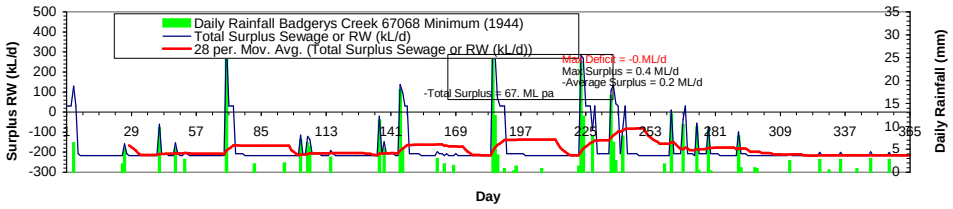


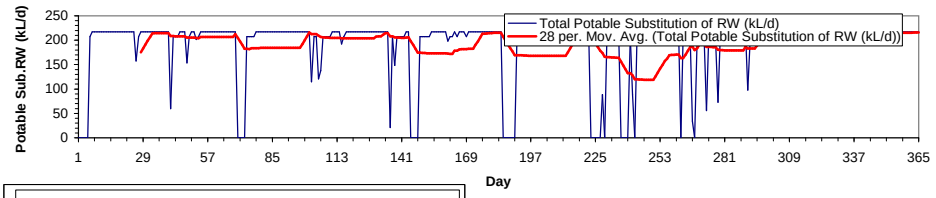


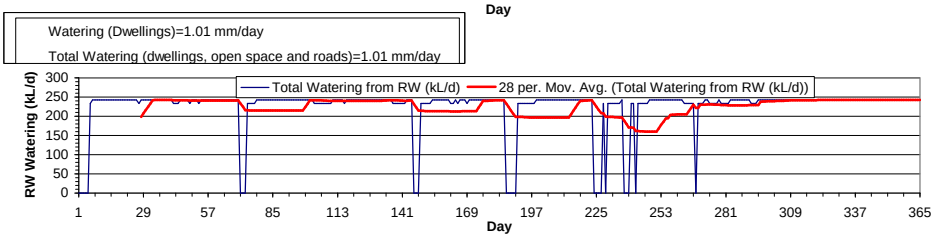


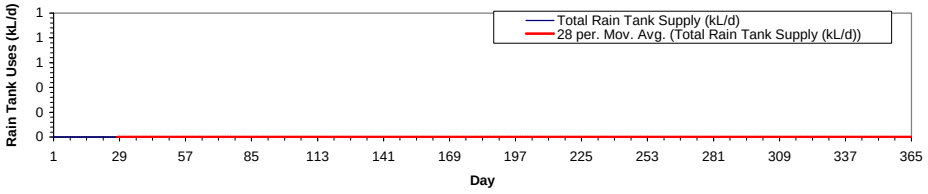
Scenario 1 - Stage 3- Dry Rainfall Year

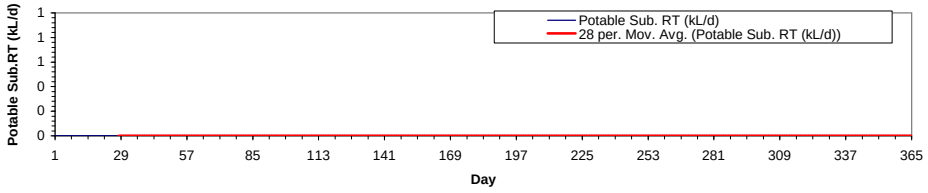


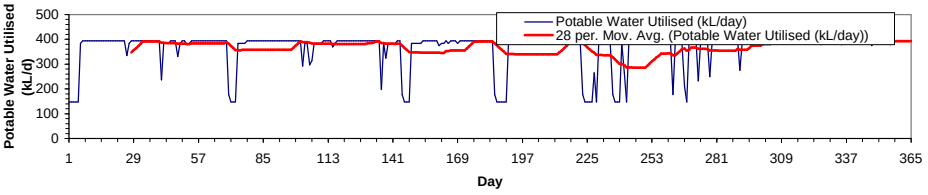


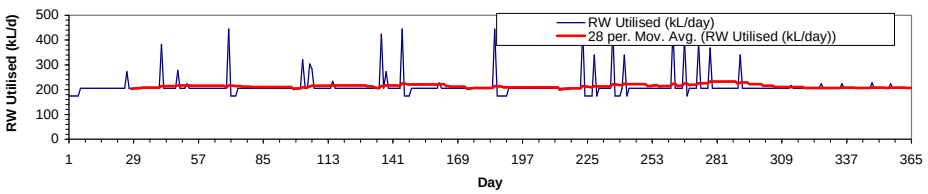




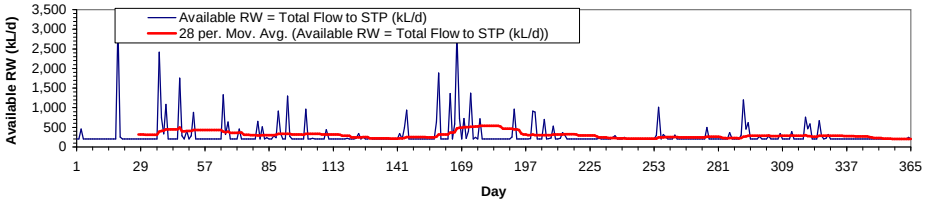


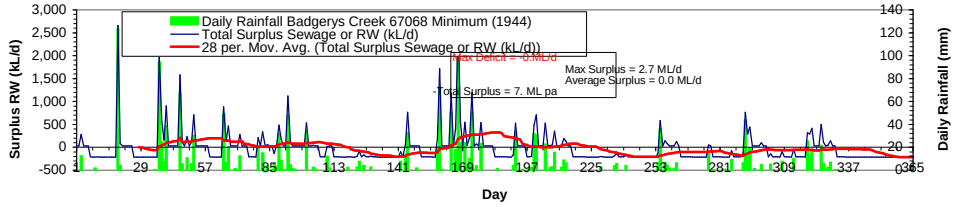


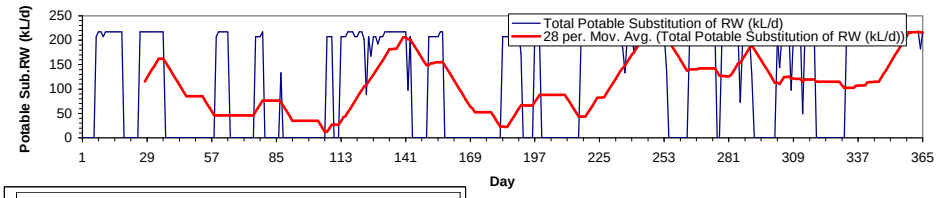


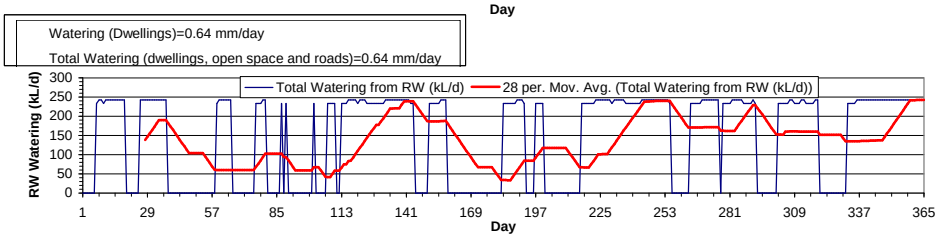


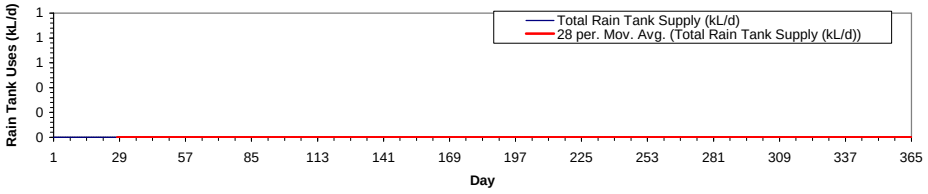
Scenario 1 - Stage 3- Wet Rainfall Year

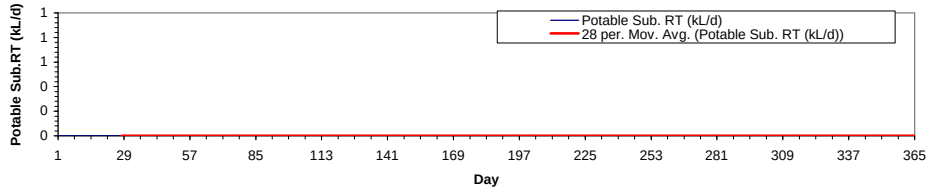


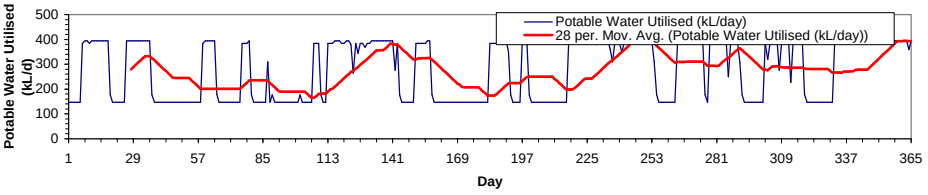


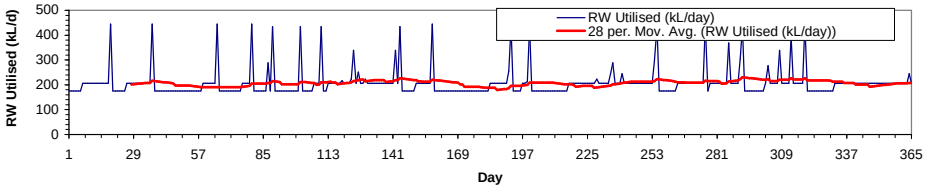




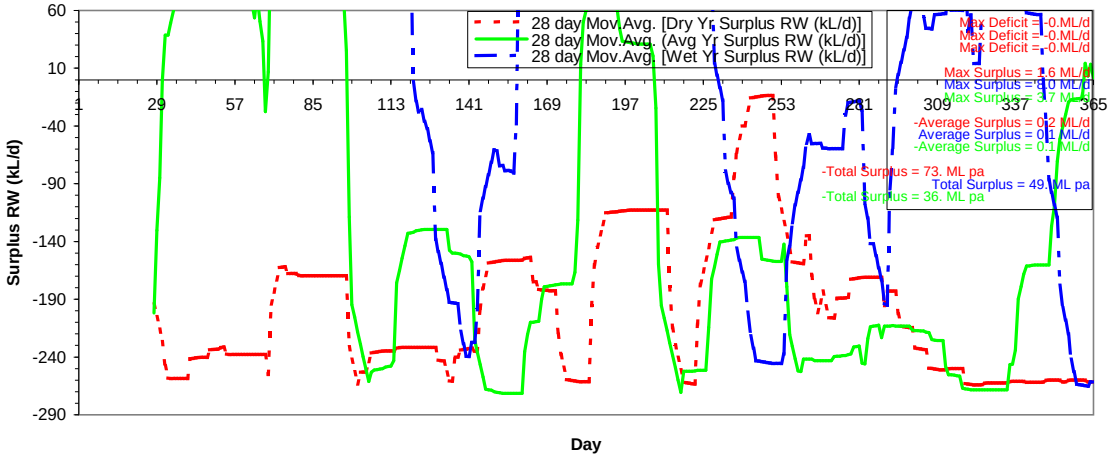


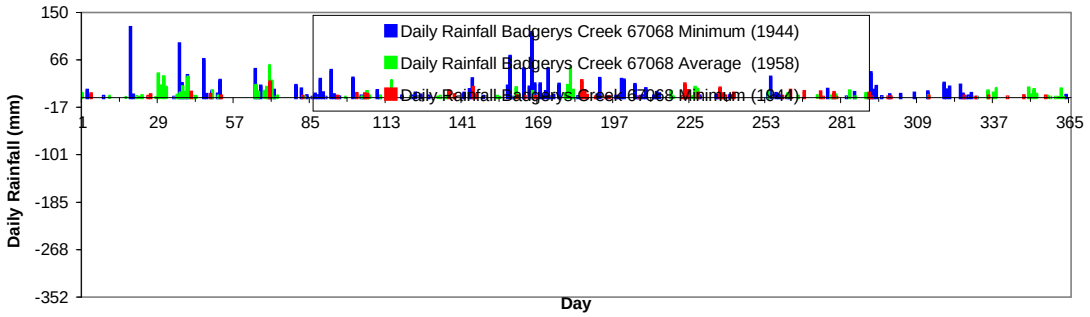




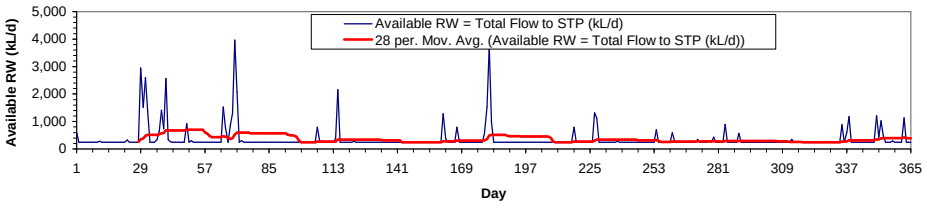


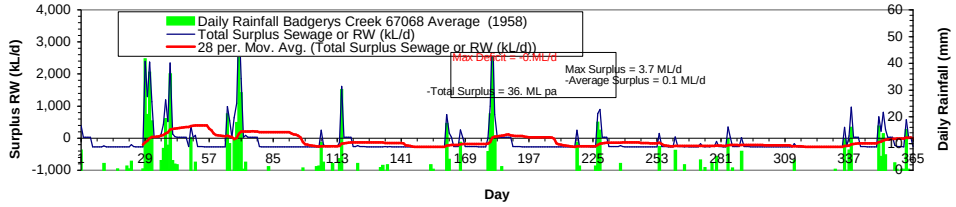
Scenario 1- Stage 4

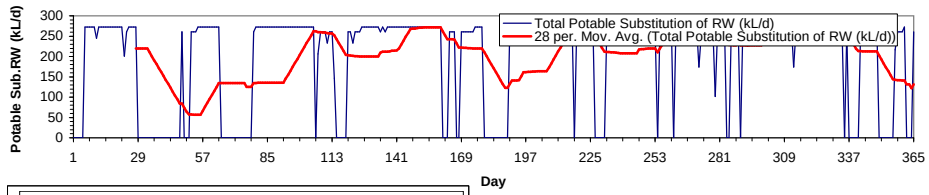


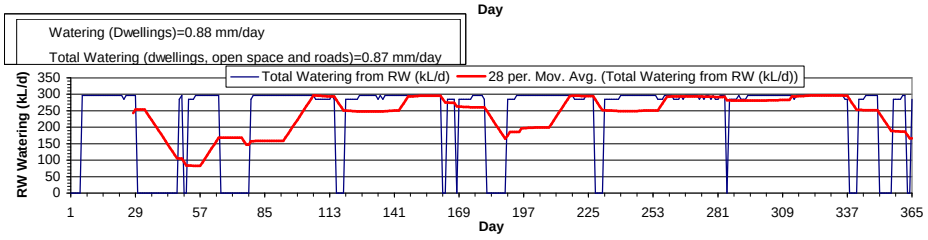


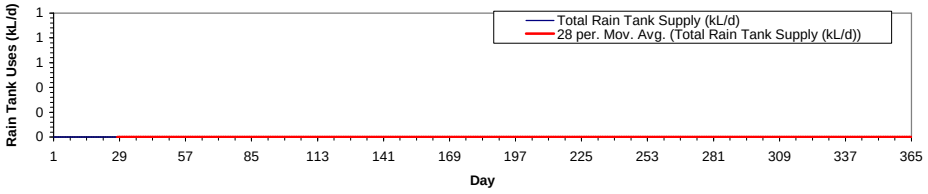
Scenario 1- Stage 4- Average Rainfall Year

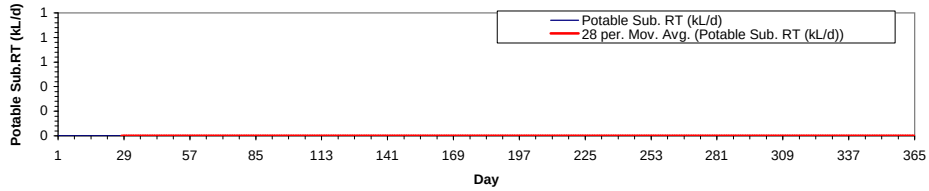


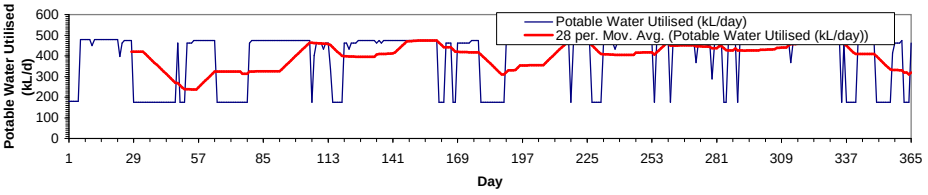


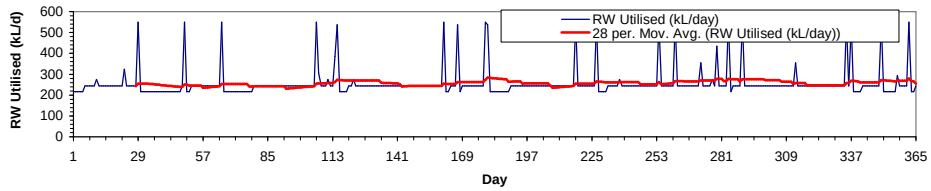




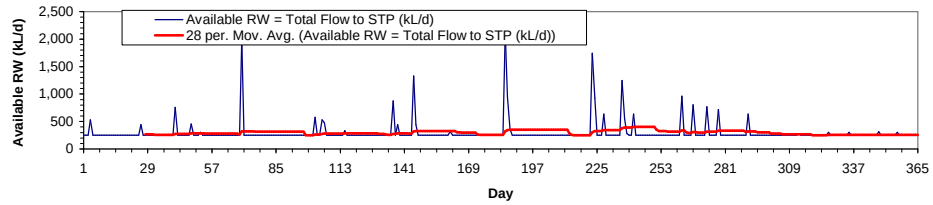


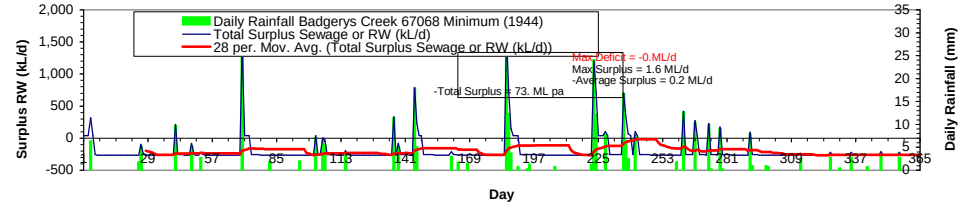


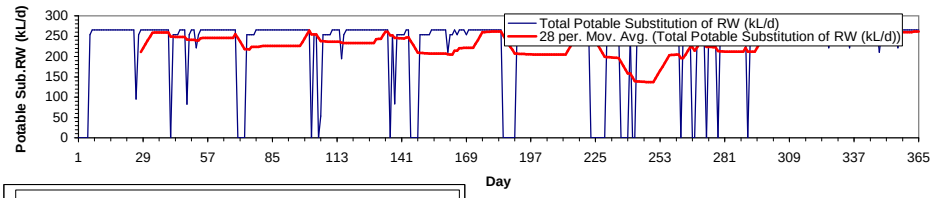


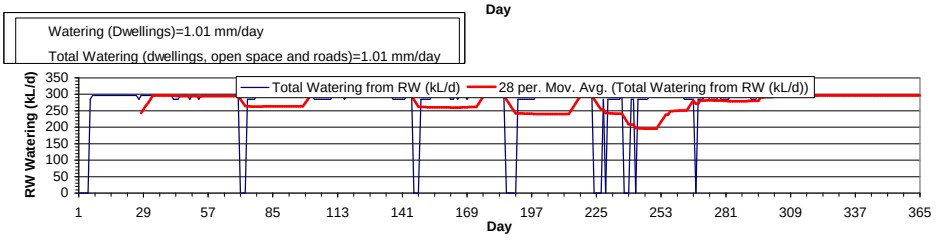


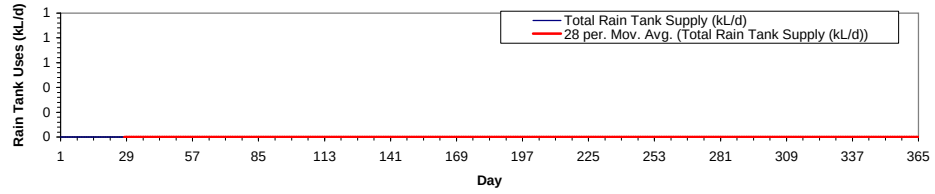
Scenario 1- Stage 4- Dry Rainfall Year

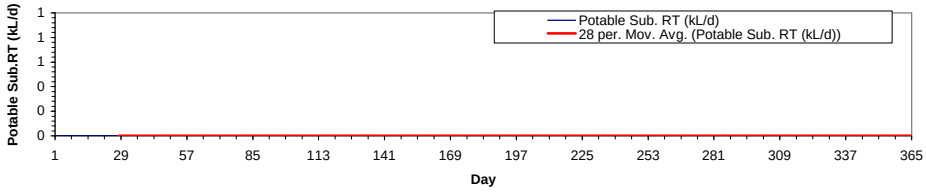


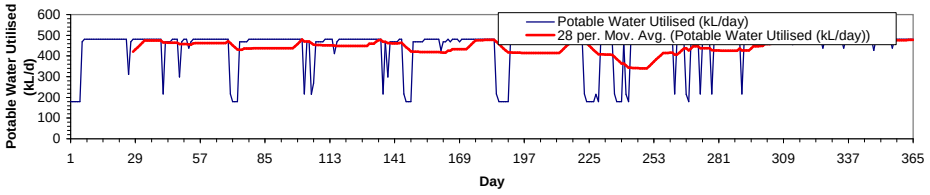


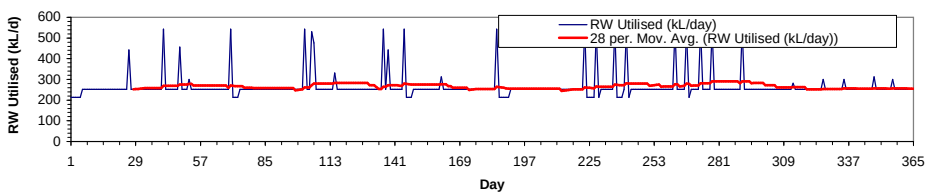




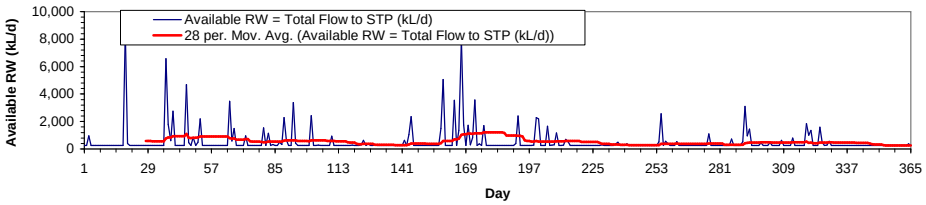


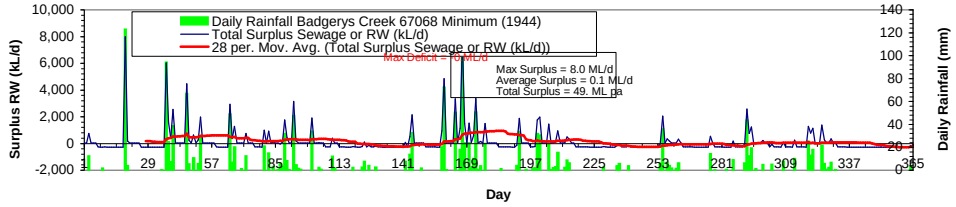


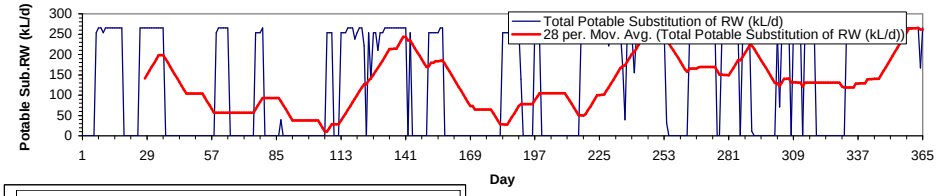


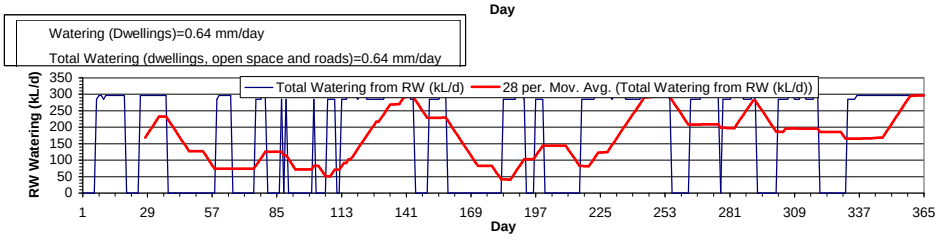


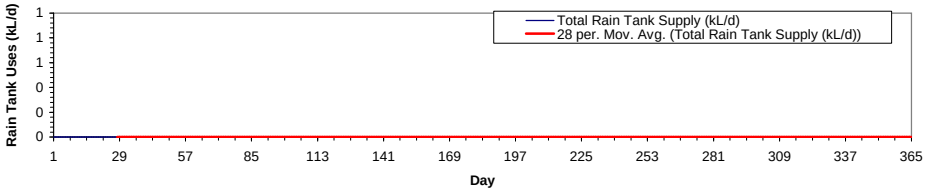
Scenario 1- Stage 4- Wet Rainfall Year

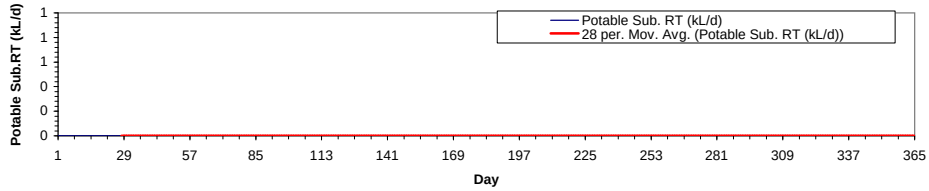


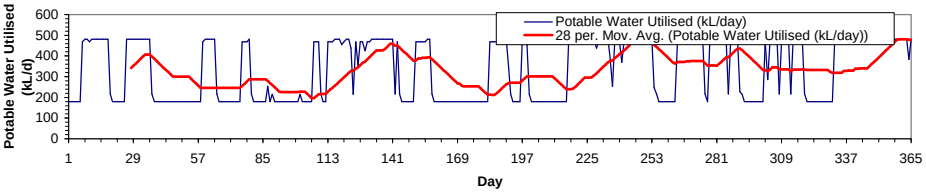


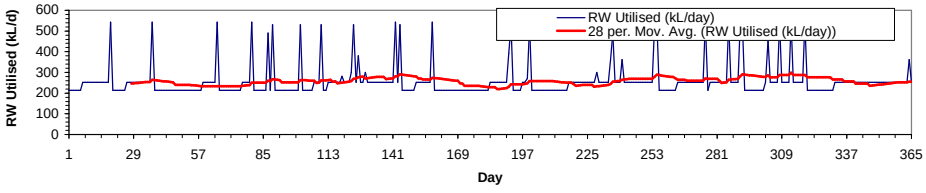




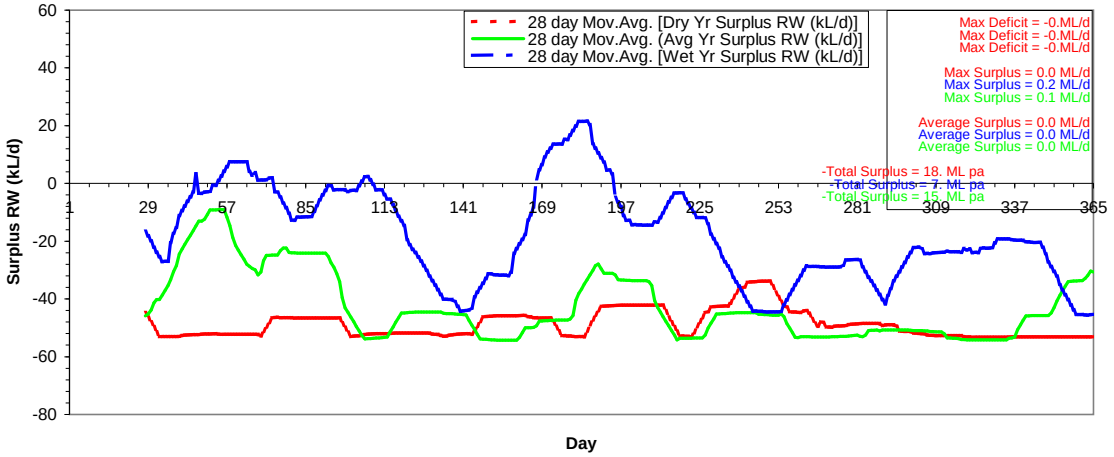


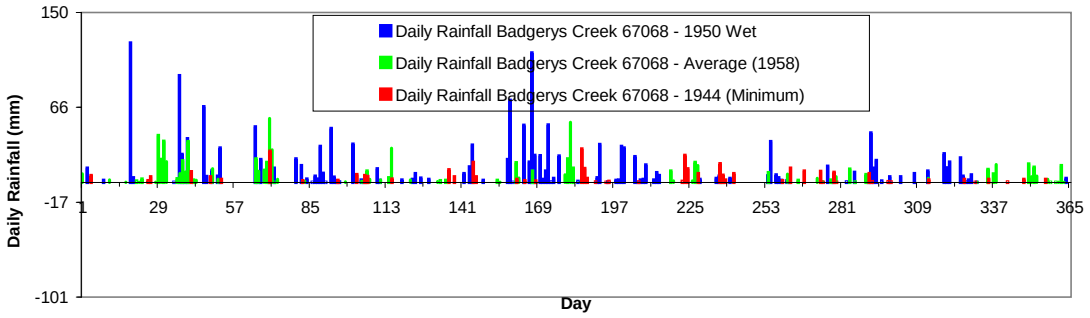




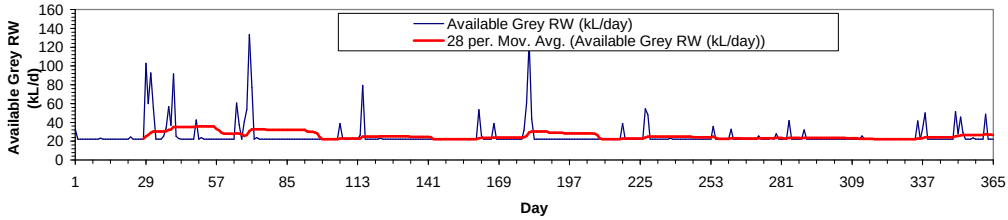


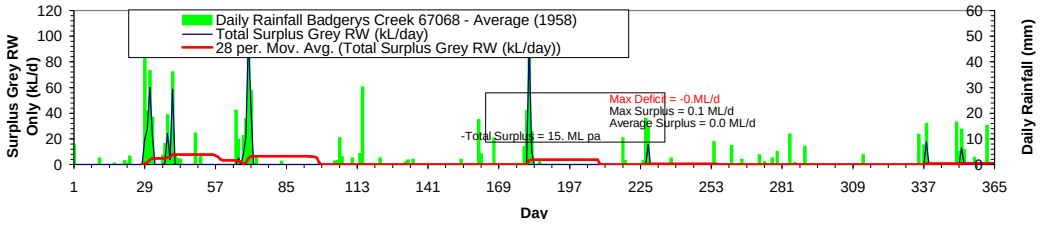
Scenario 2 - Stage 1

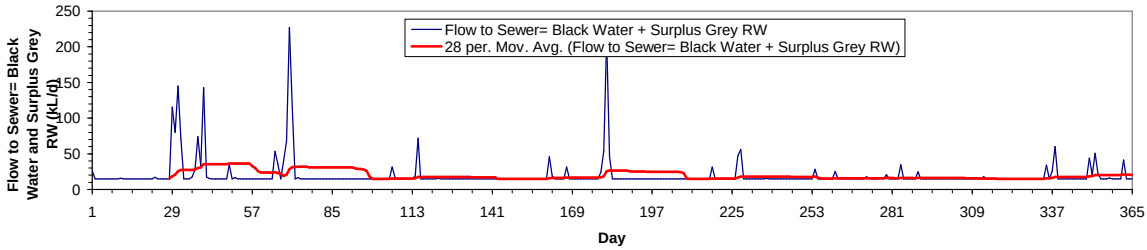


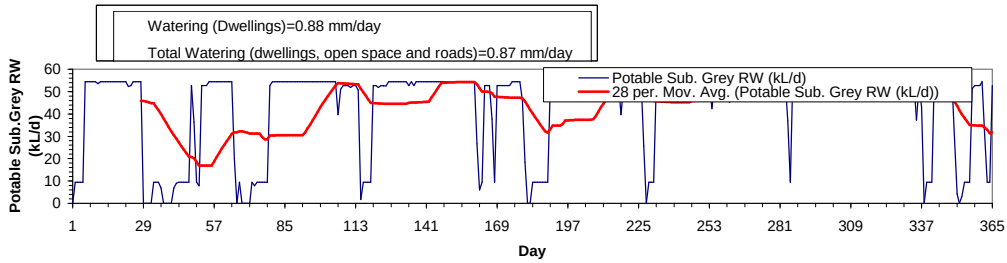


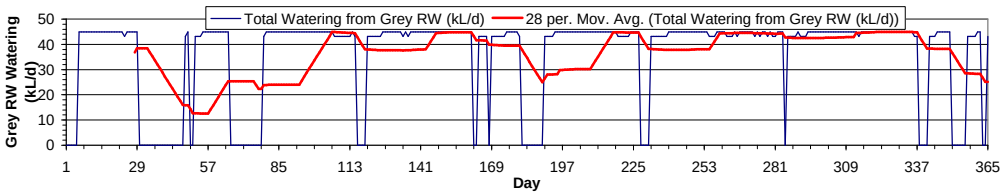
Scenario 2 - Stage 1 - Average Rainfall Year

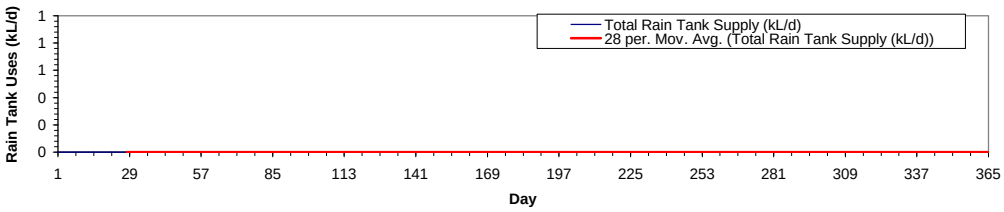


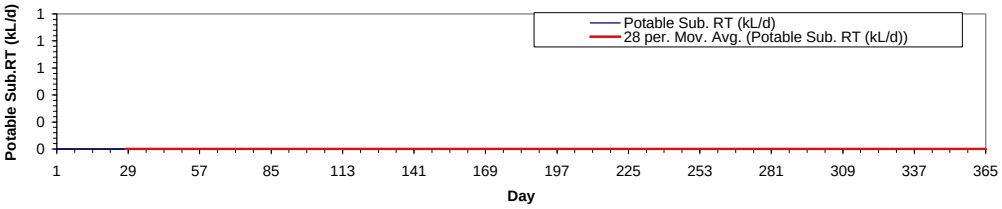




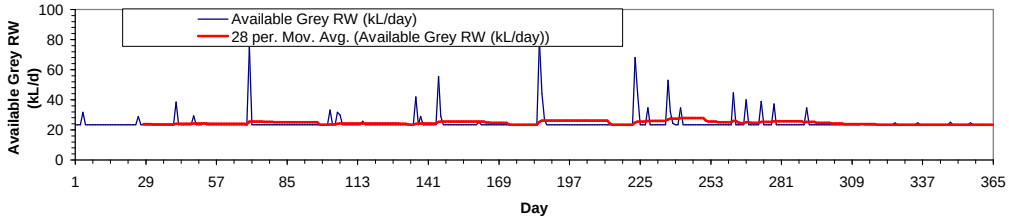


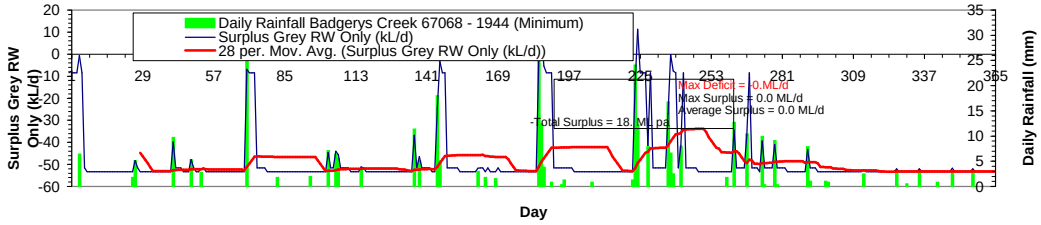


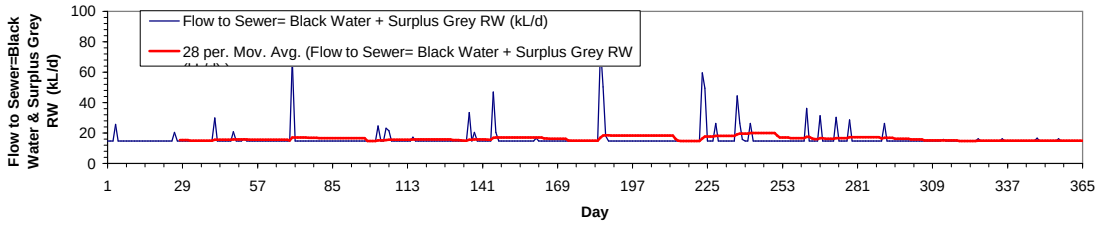


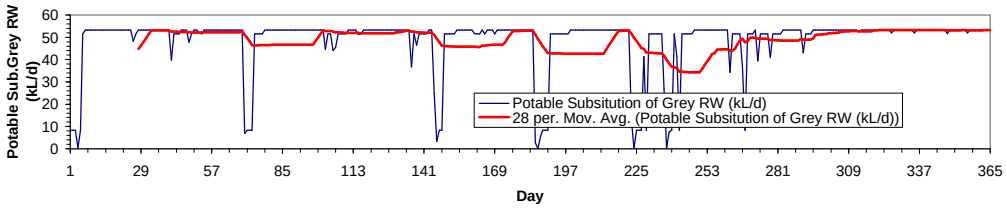


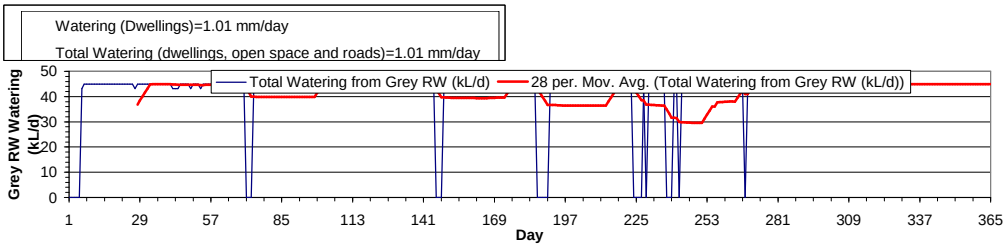
Scenario 2 - Stage 1 - Dry Rainfall Year

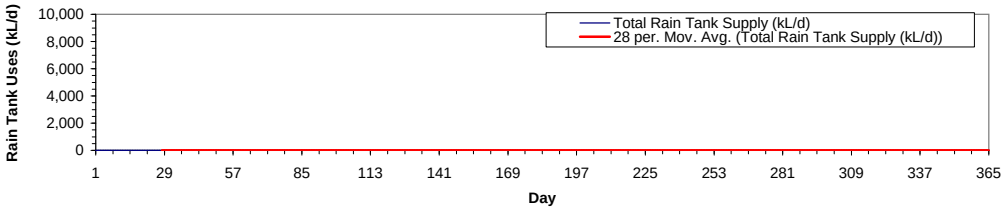


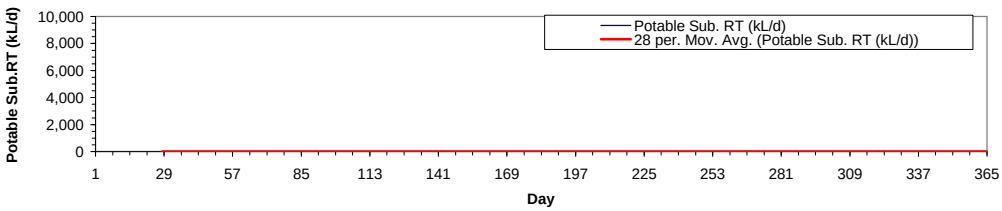




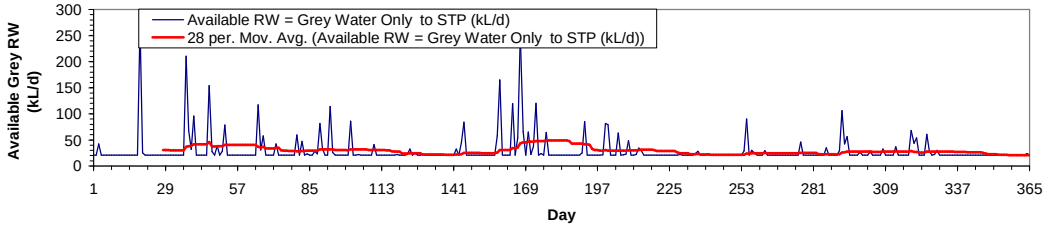


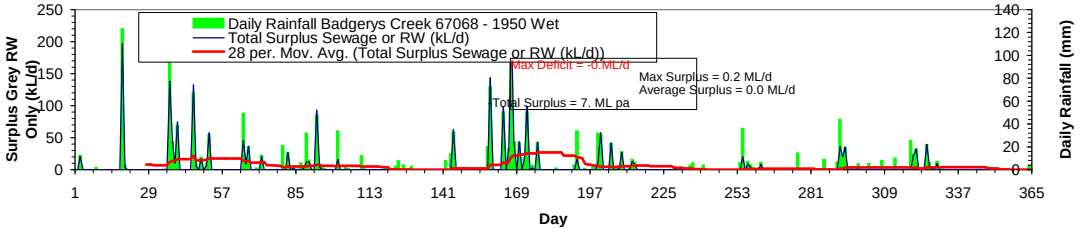


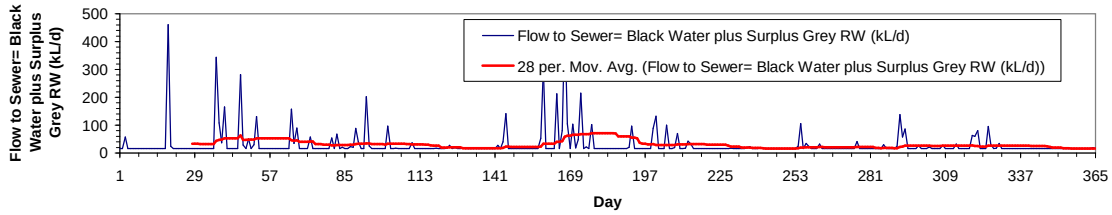


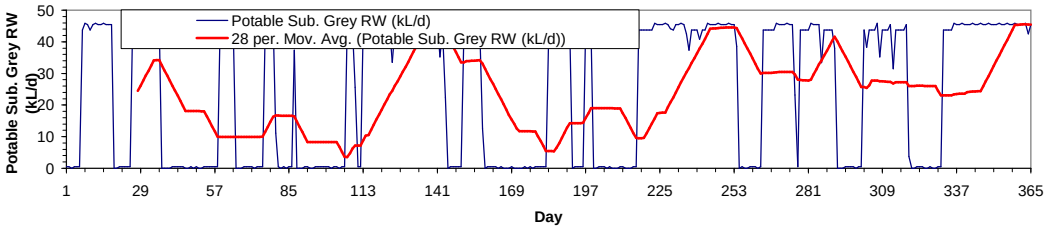


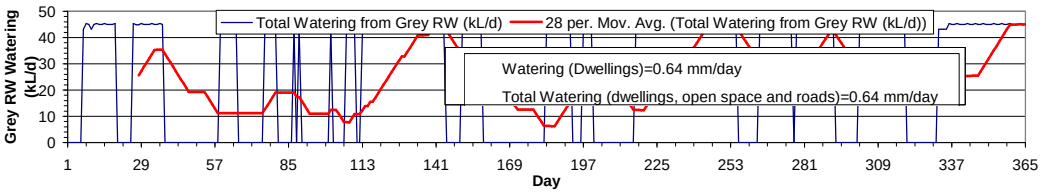
Scenario 2 - Stage 1 - Wet Rainfall Year

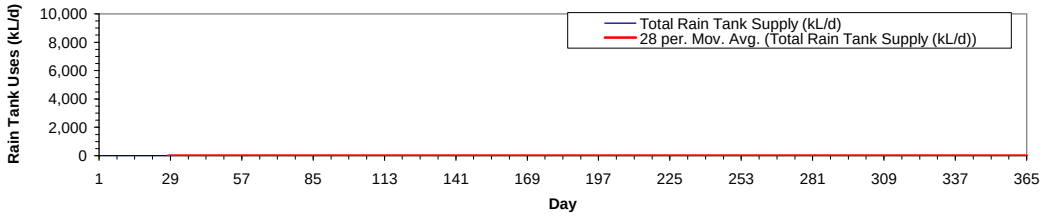


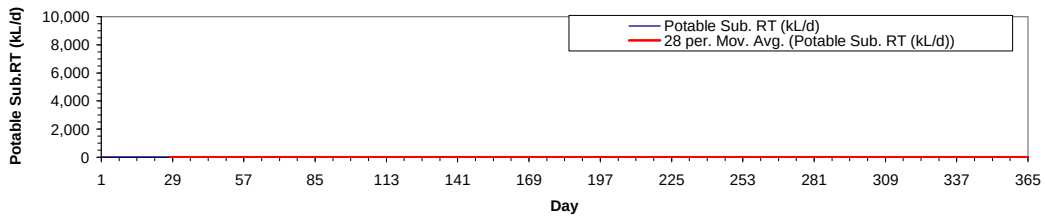




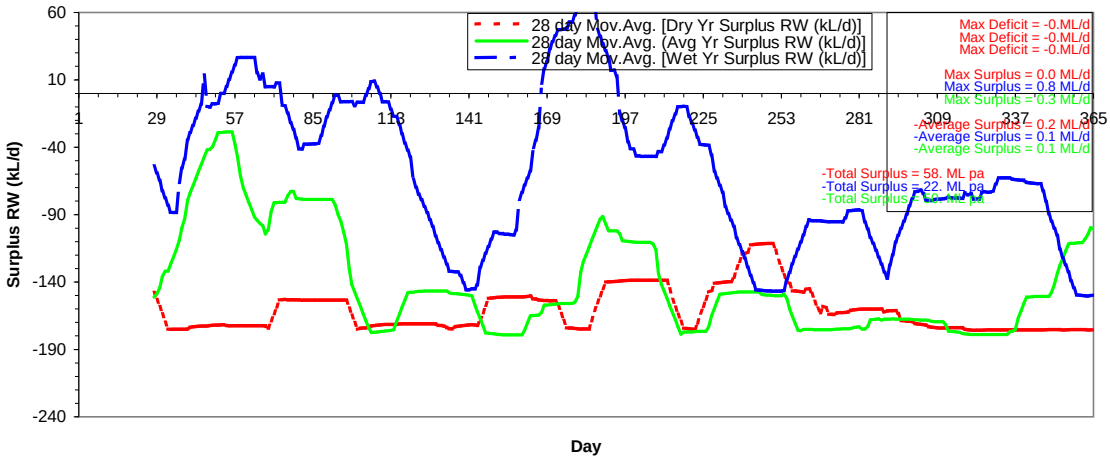


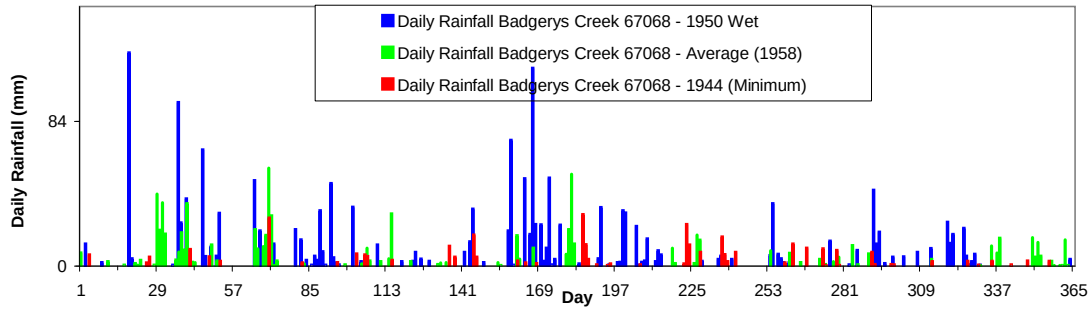




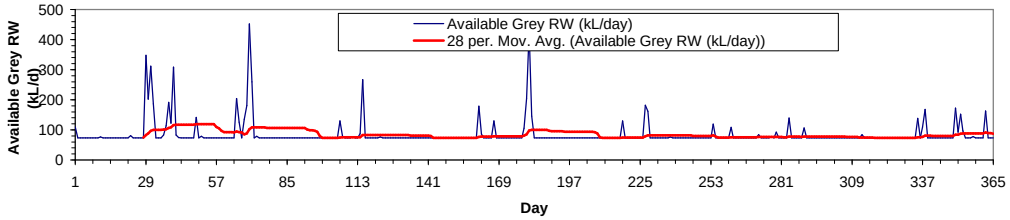


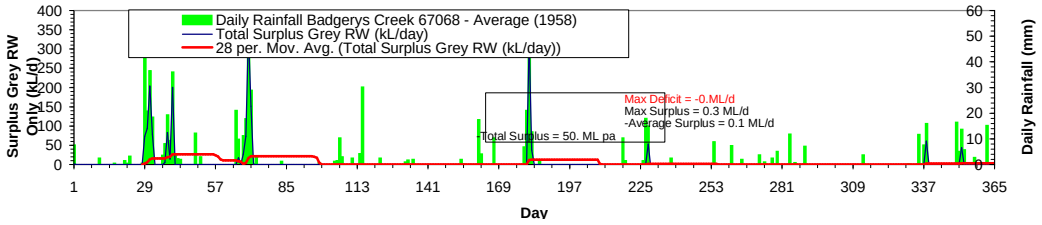
Scenario 2- Stage 2

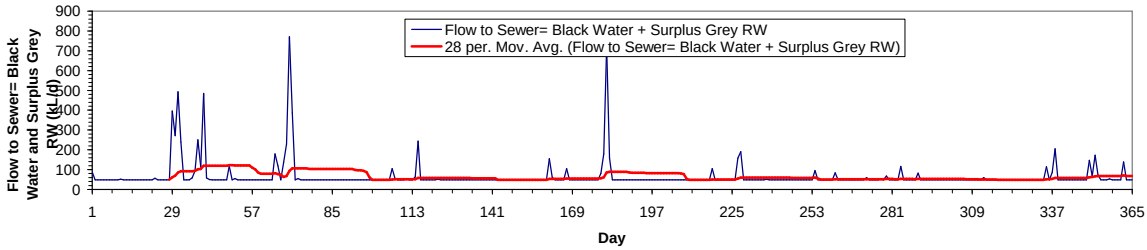


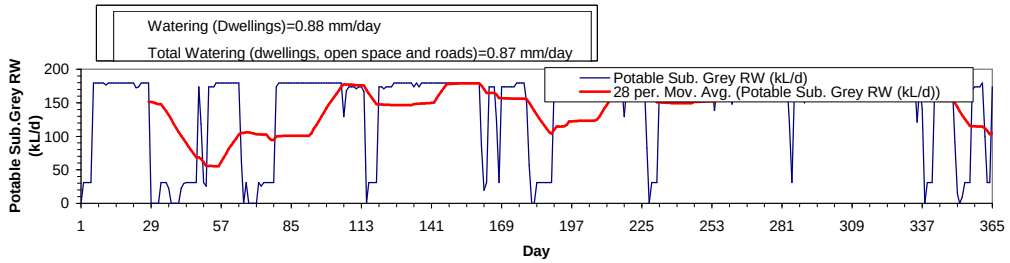


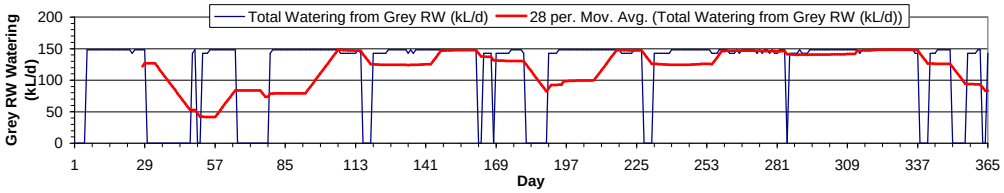
Scenario 2- Stage 2 - Average Rainfall Year

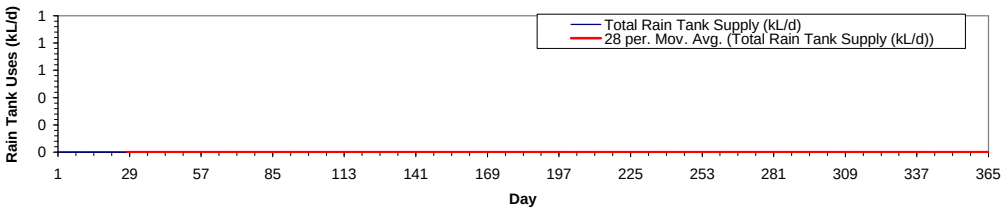


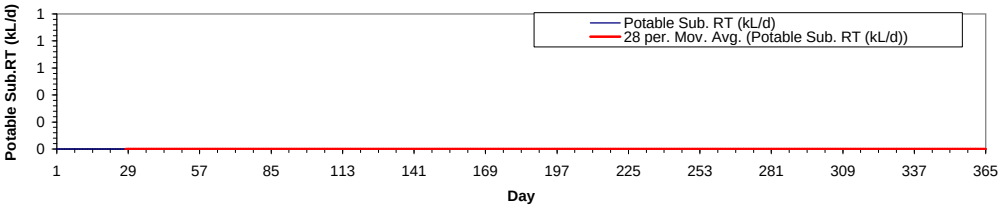




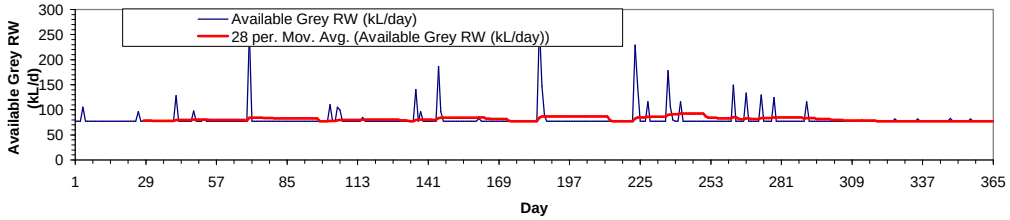


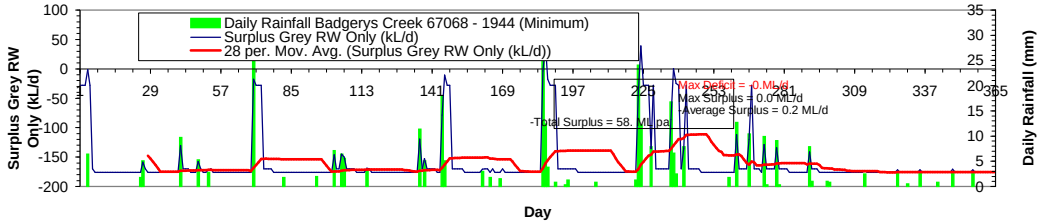


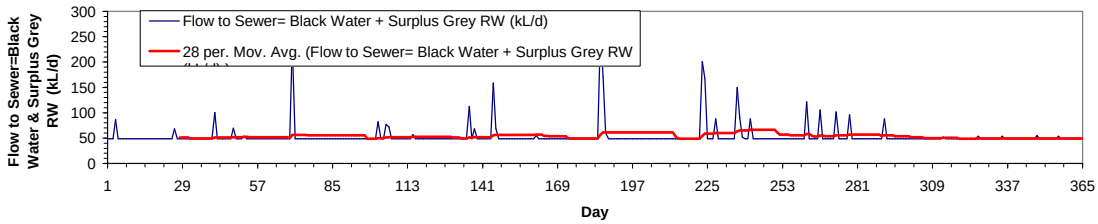


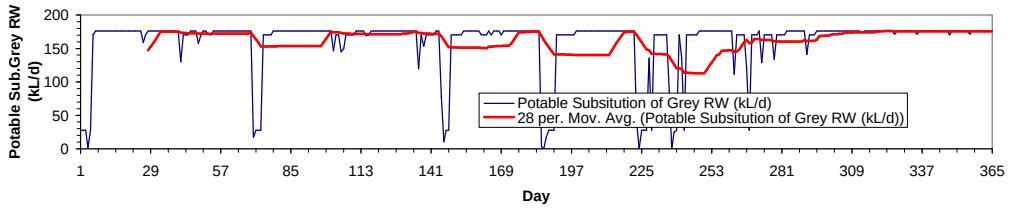


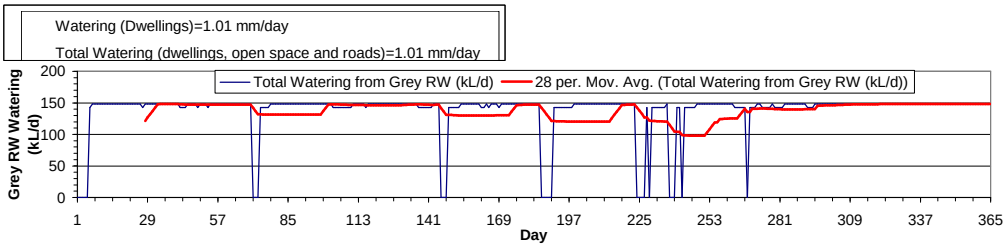
Scenario 2- Stage 2 - Dry Rainfall Year

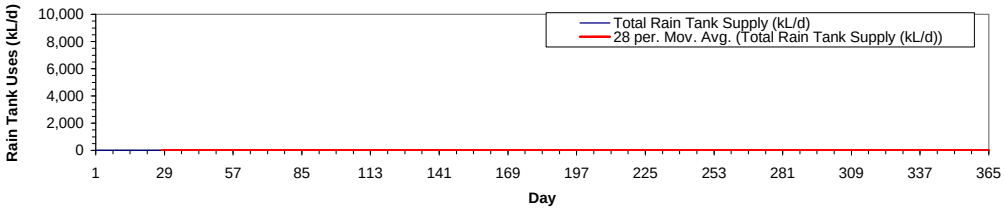


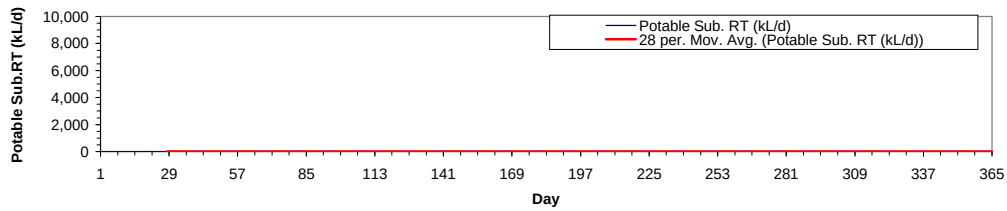




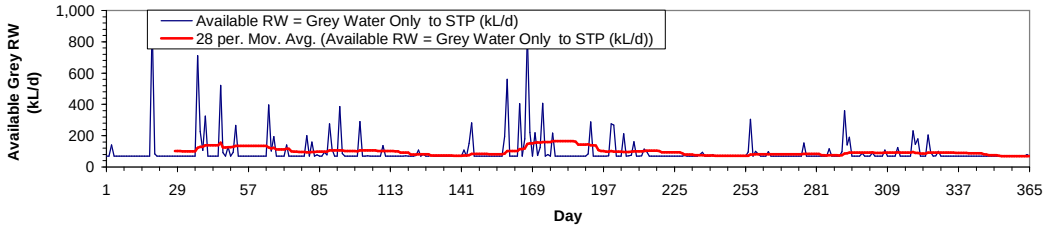


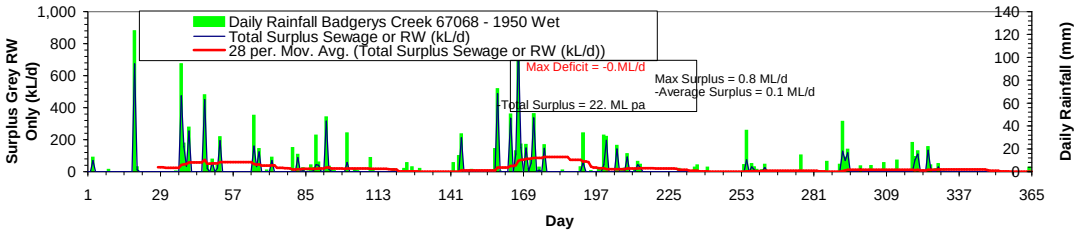


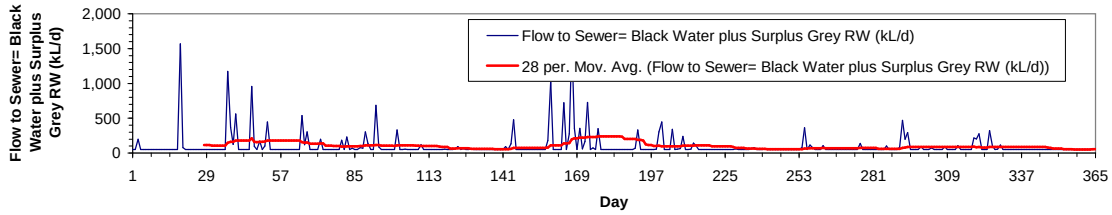


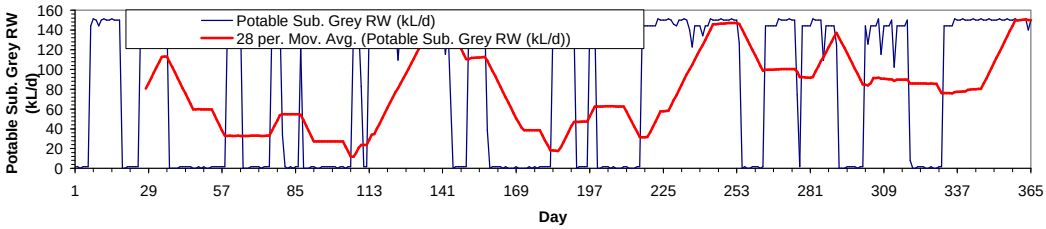


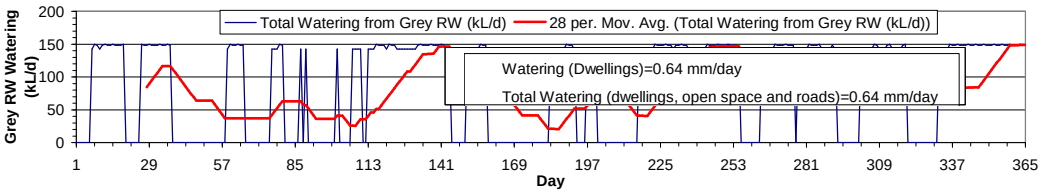
Scenario 2- Stage 2 - Wet Rainfall Year

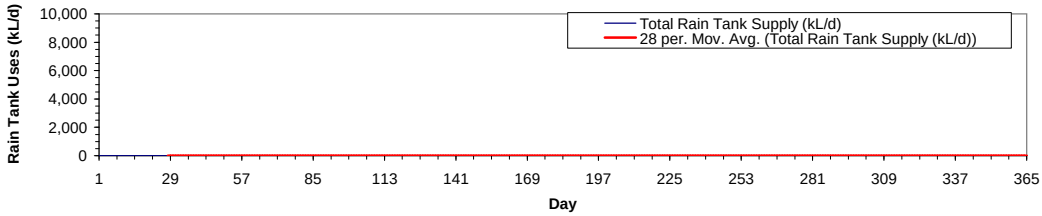


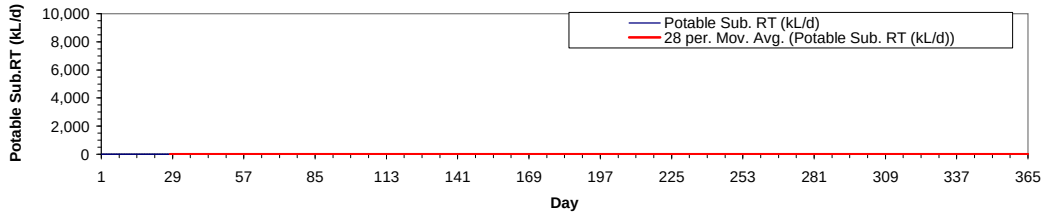




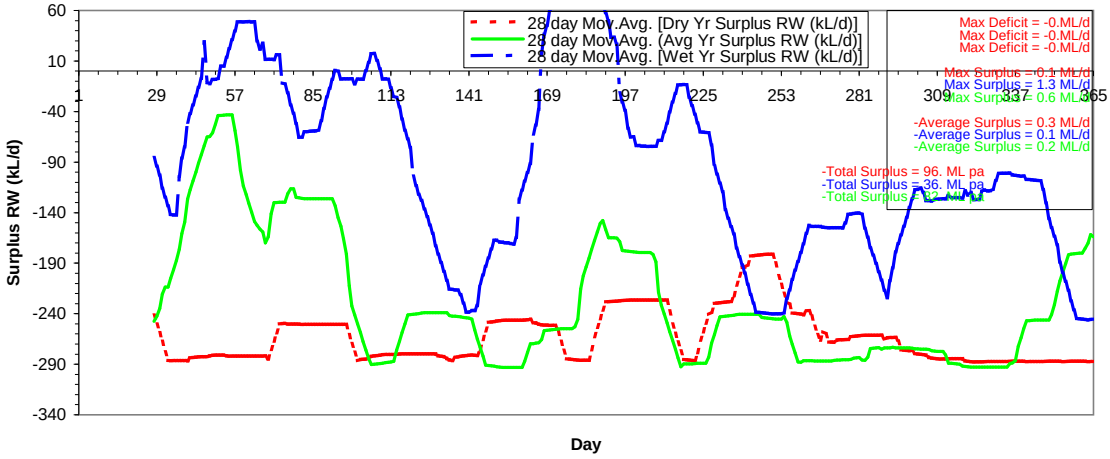


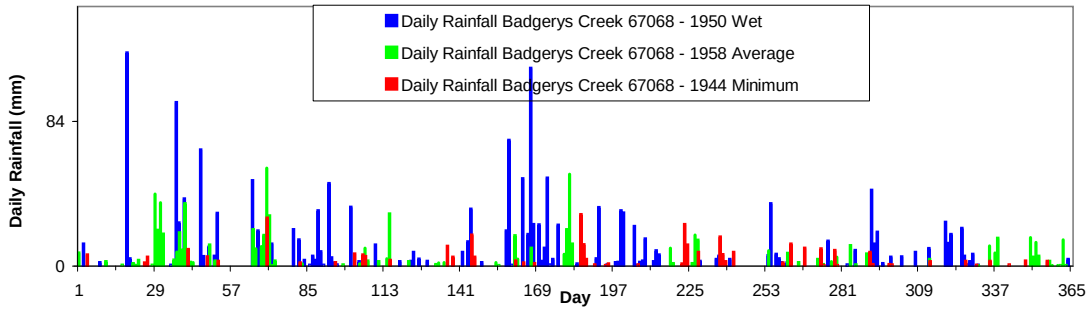




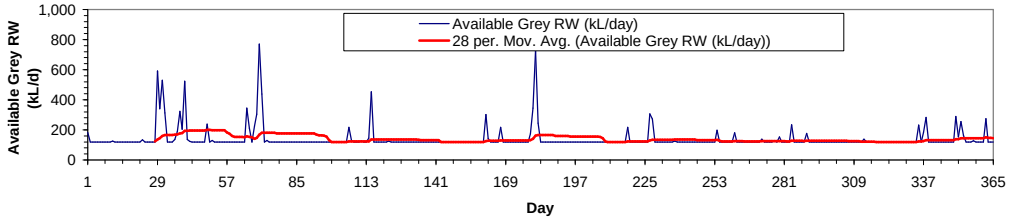


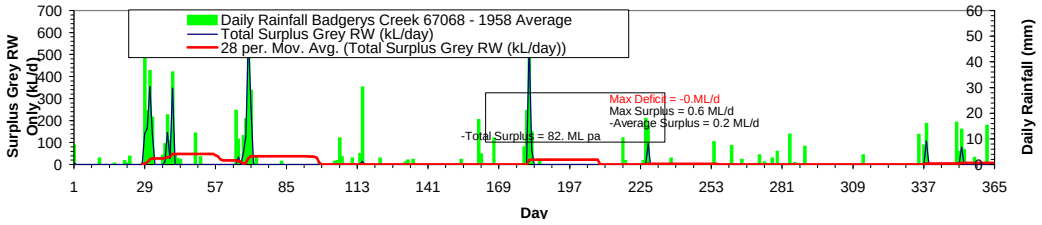
Scenario 2- Stage 3

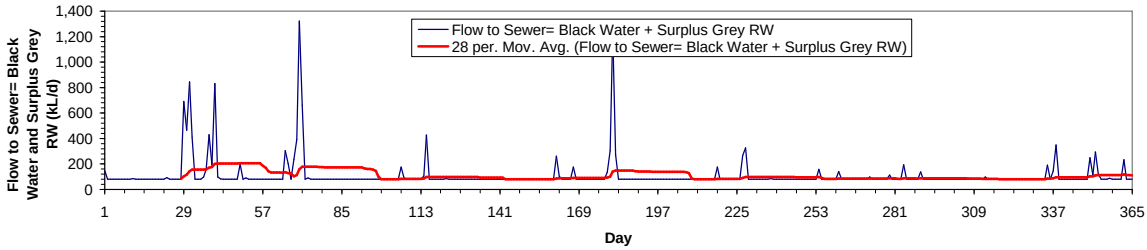


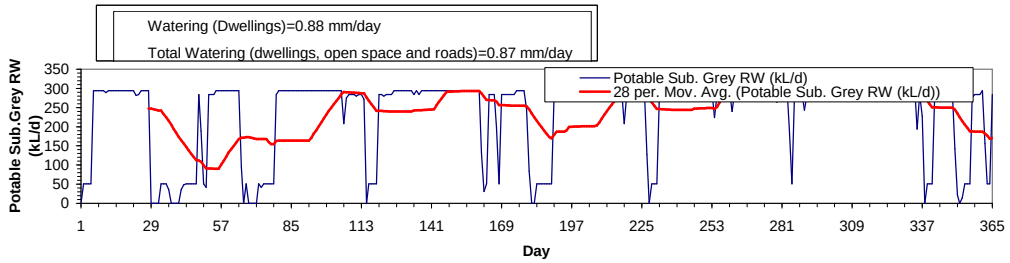


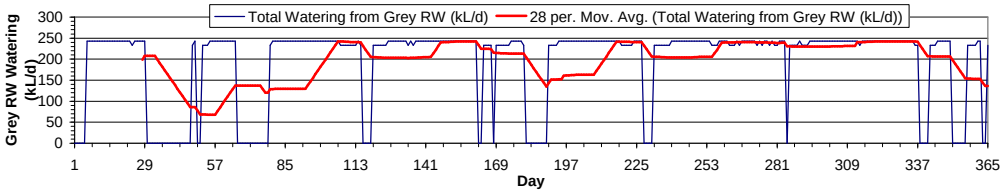
Scenario 2- Stage 3 - Average Rainfall Year

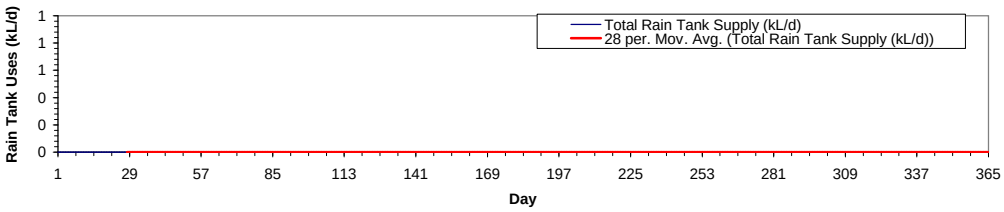


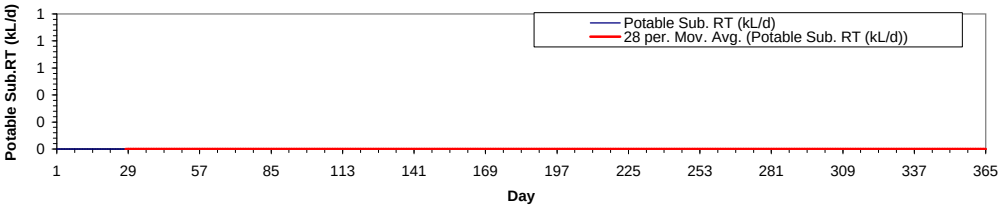




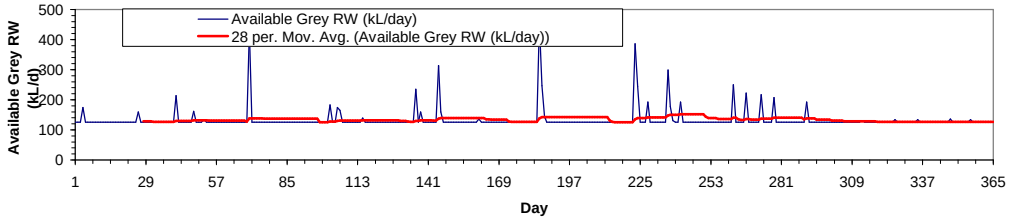


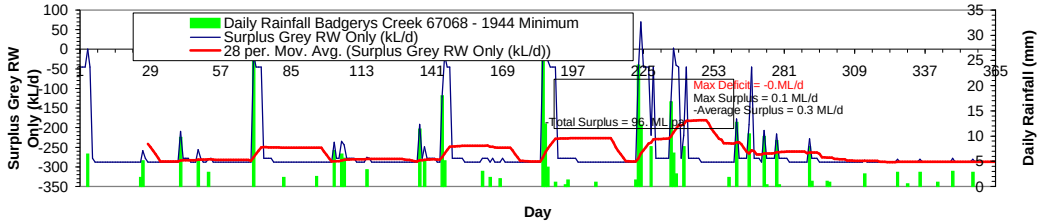


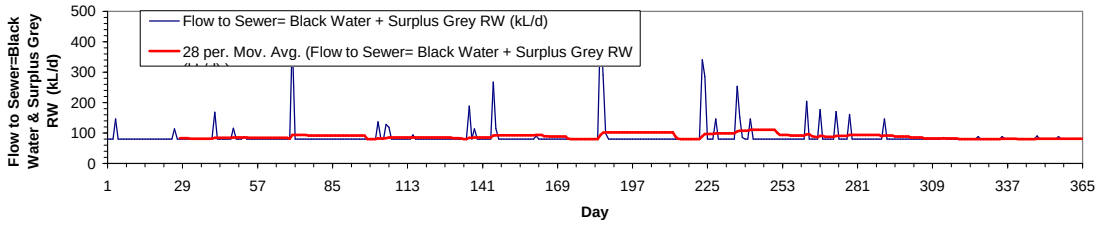


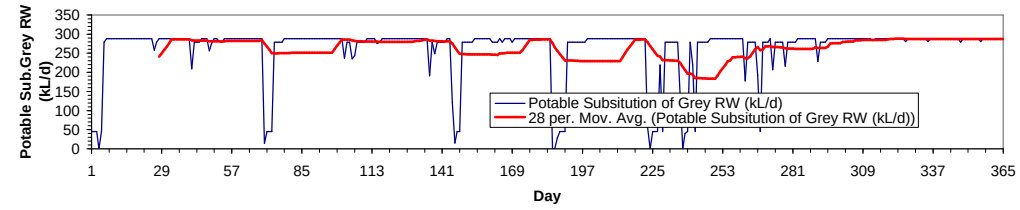


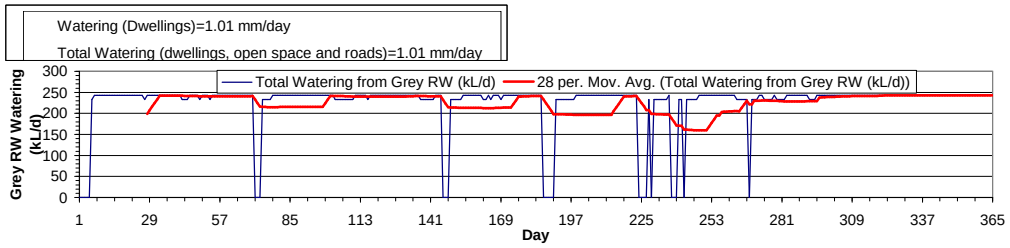
Scenario 2- Stage 3 - Dry Rainfall Year

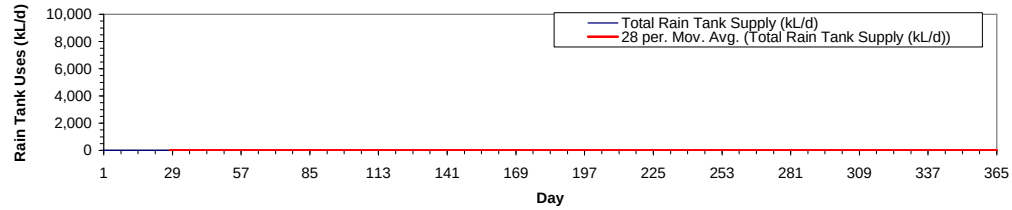


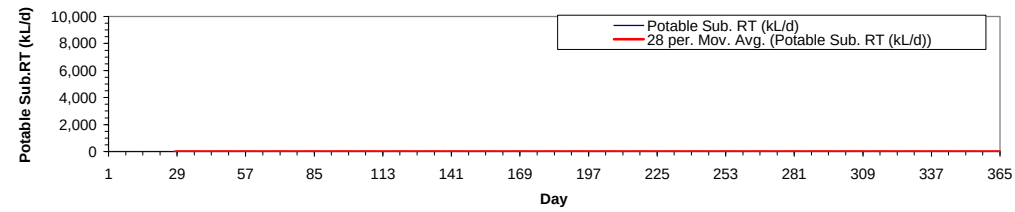




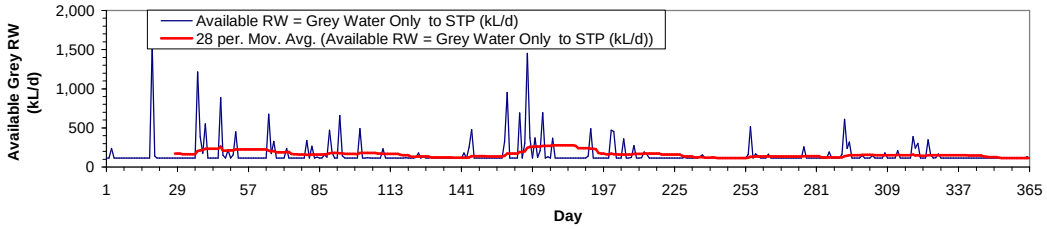


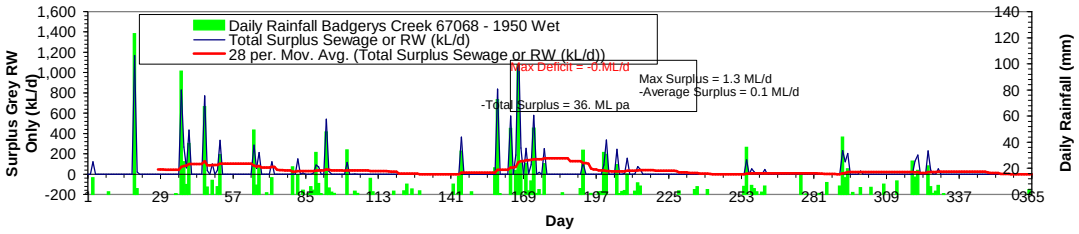


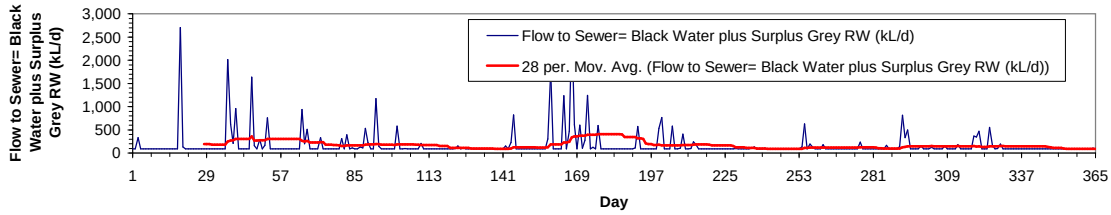


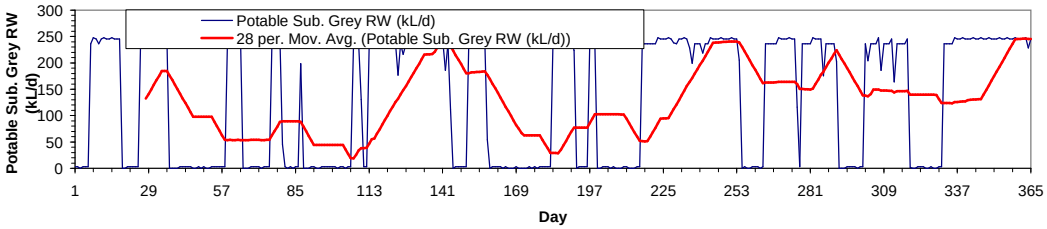


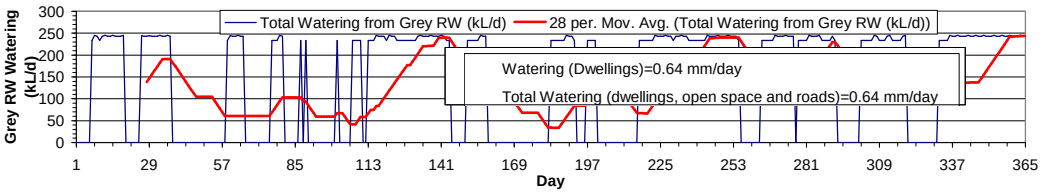
Scenario 2- Stage 3 - Wet Rainfall Year

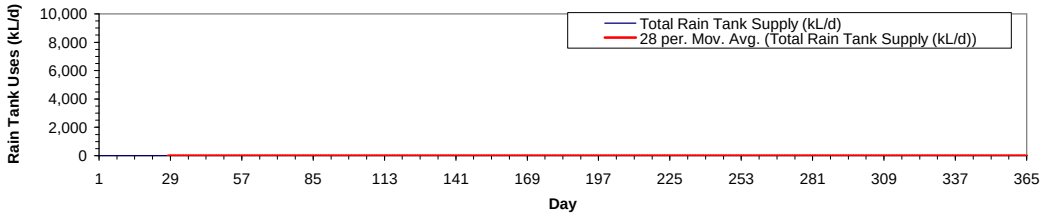


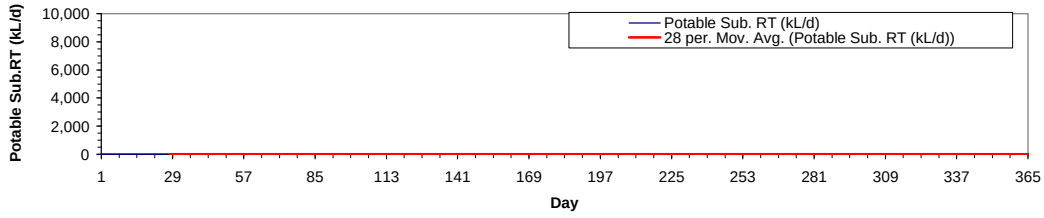




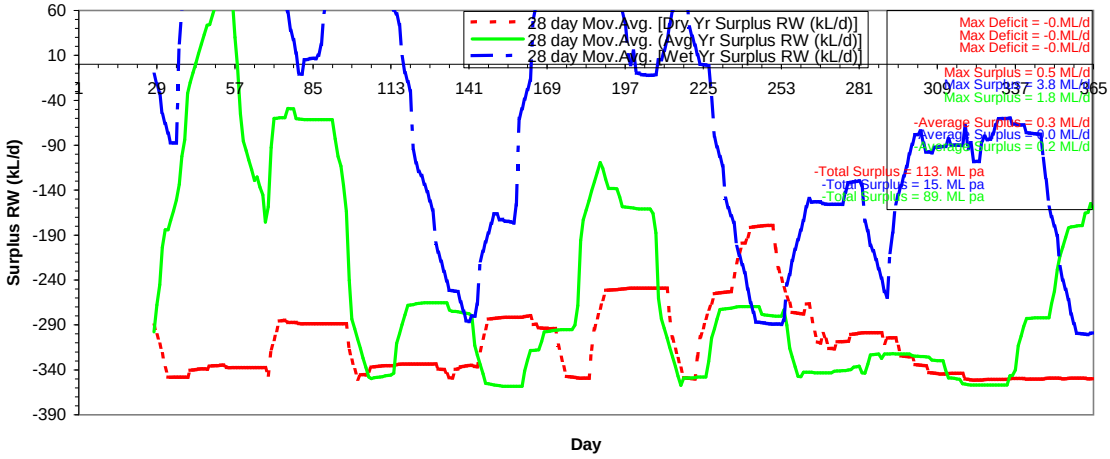


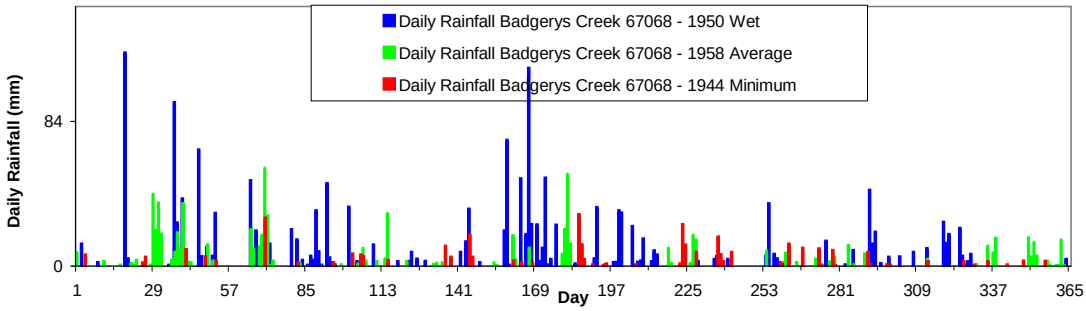




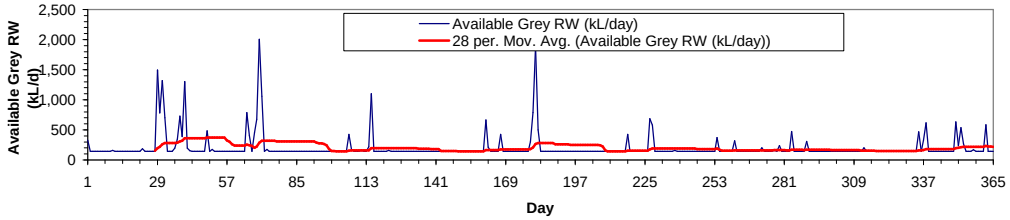


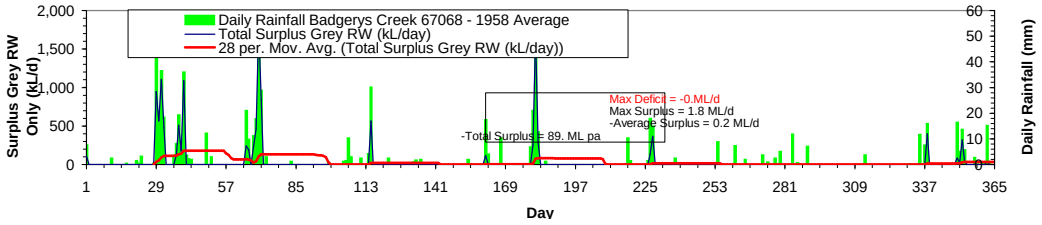
Scenario 2- Stage 4

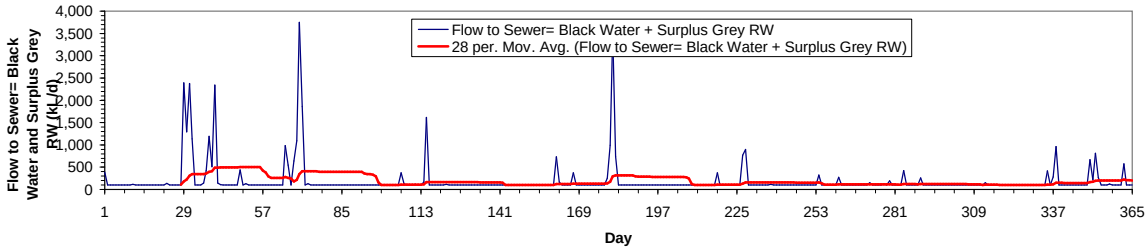


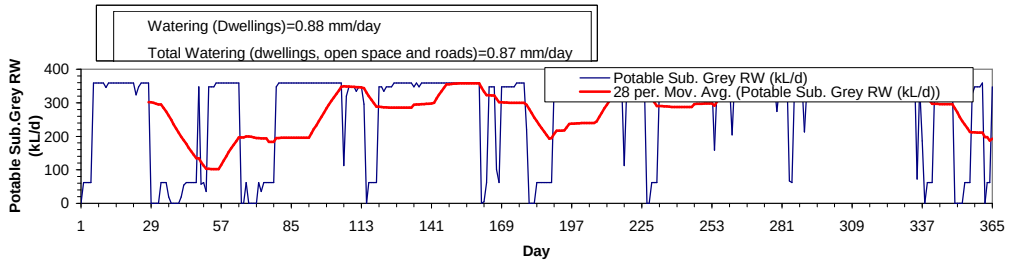


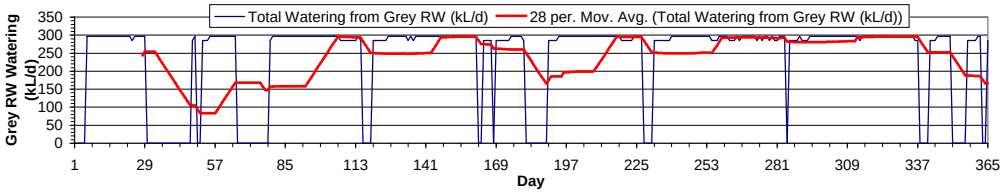
Scenario 2- Stage 4 - Average Rainfall Year

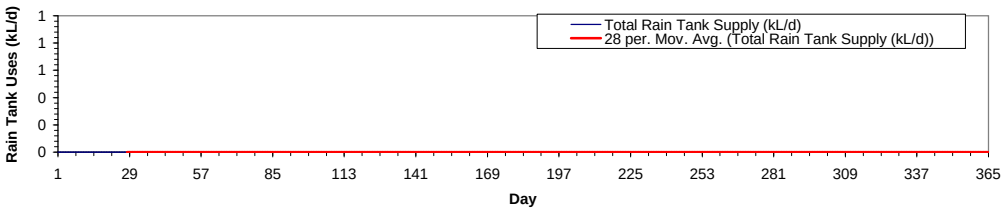


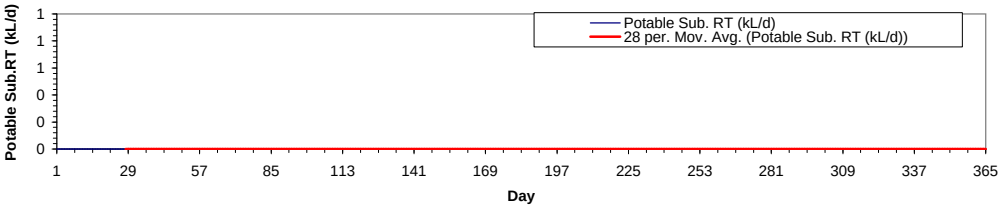




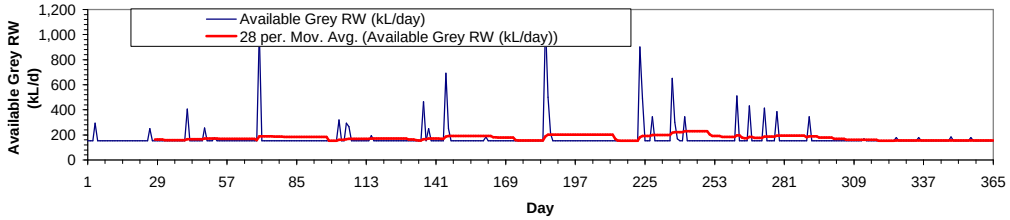


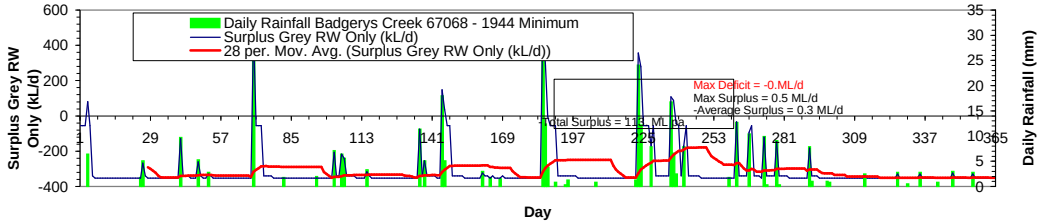


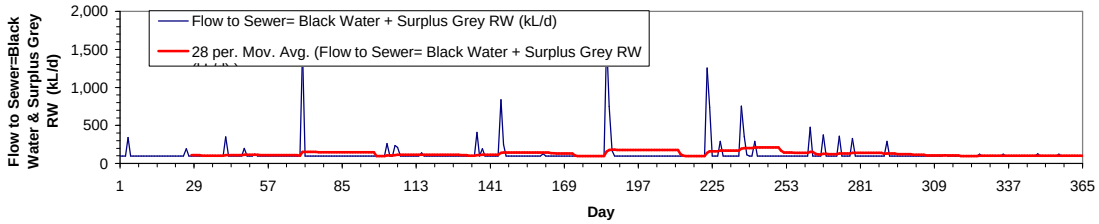


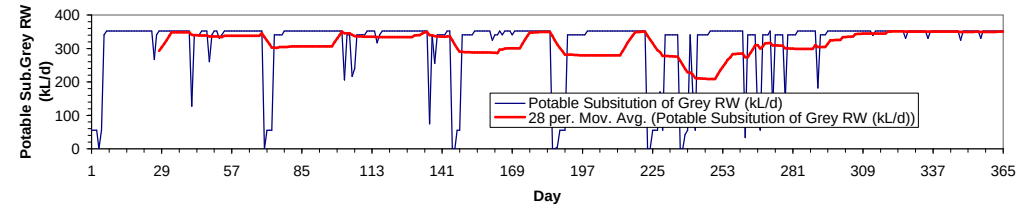


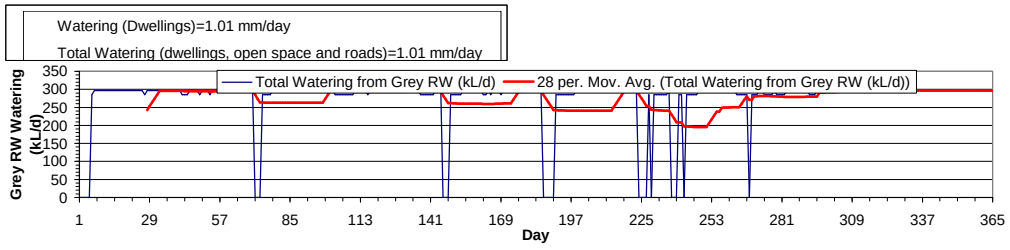
Scenario 2- Stage 4 - Dry Rainfall Year

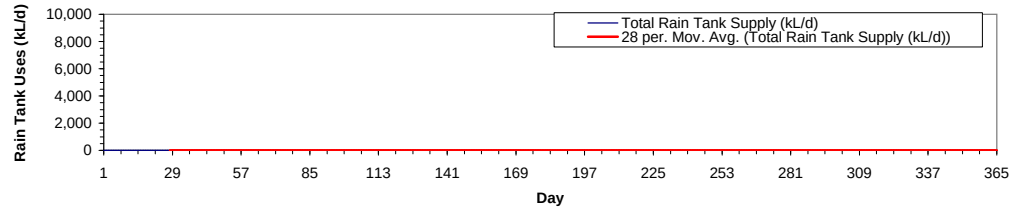


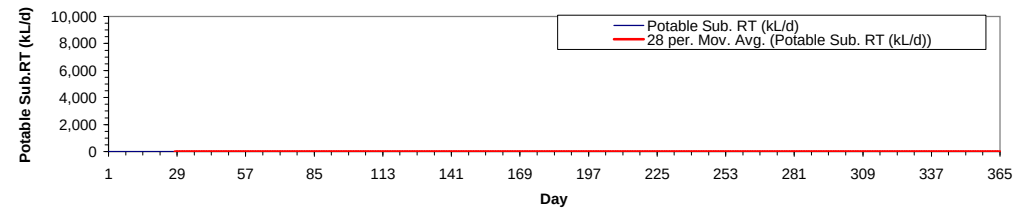




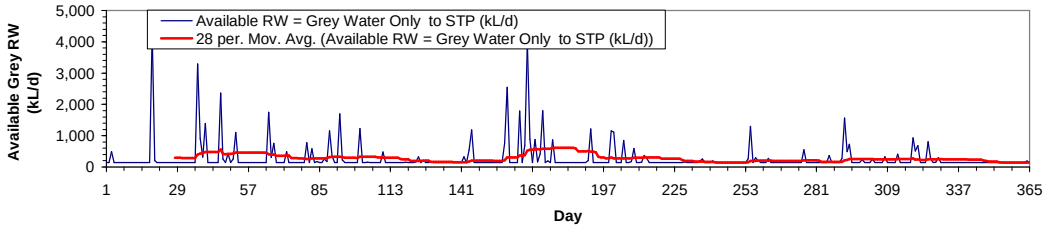


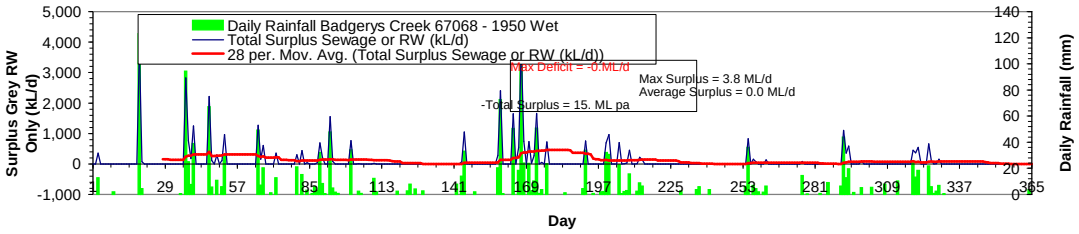


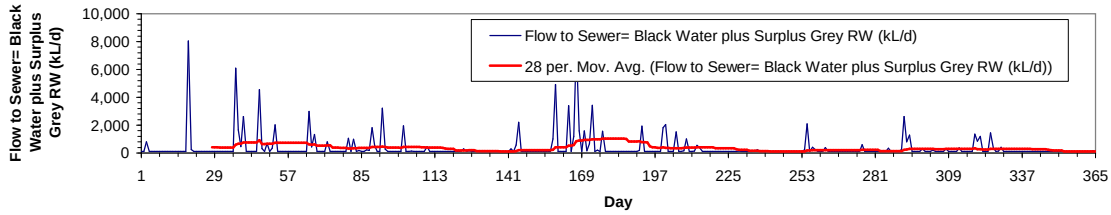


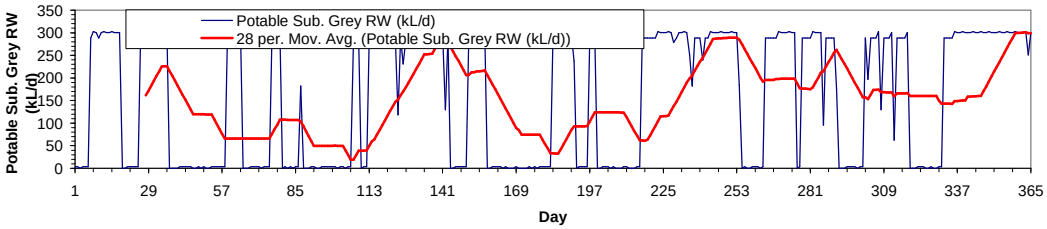


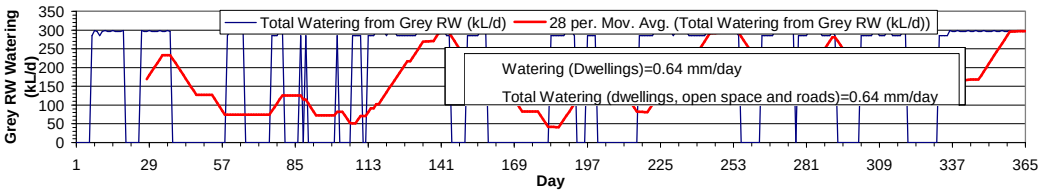
Scenario 2- Stage 4 - Wet Rainfall Year

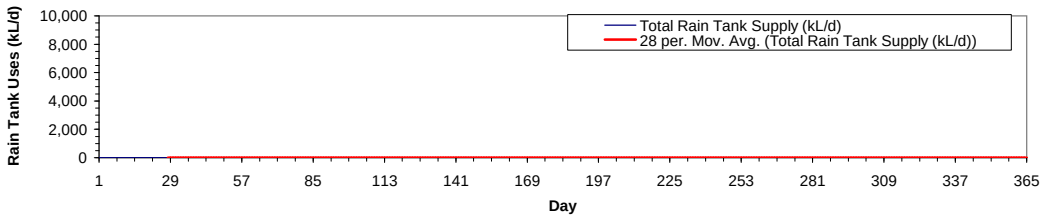


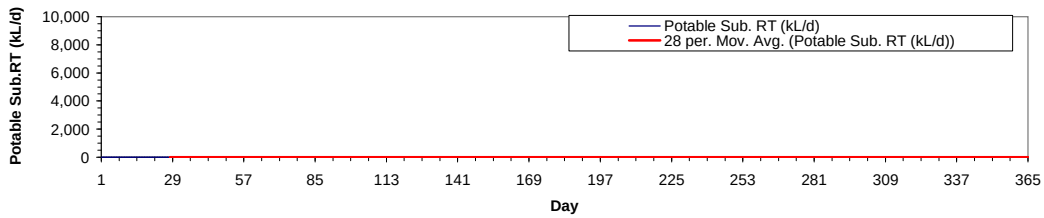




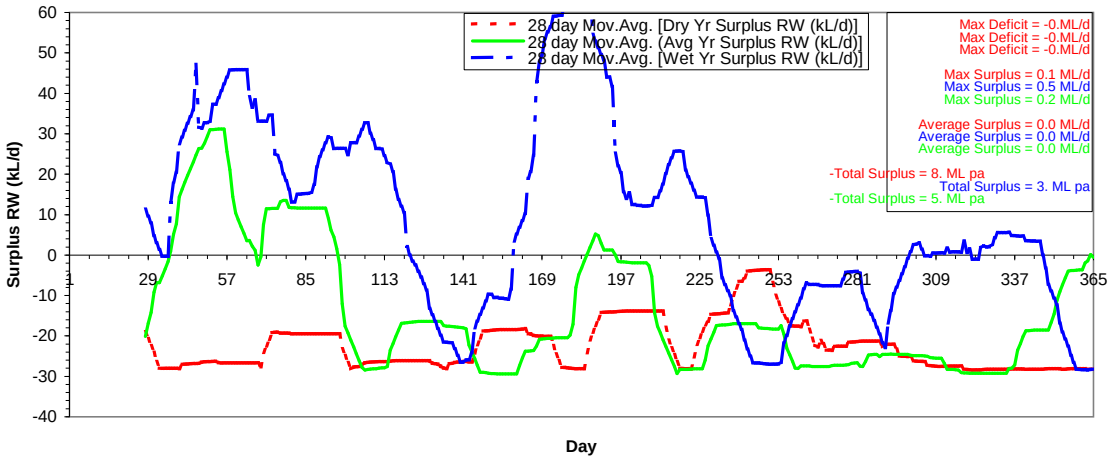


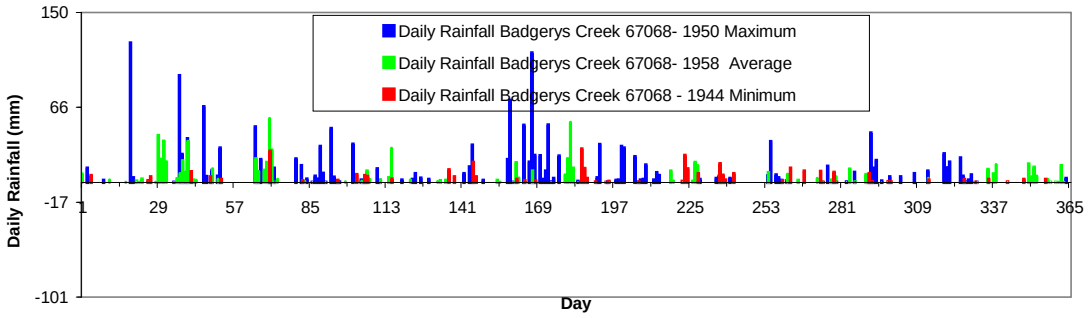




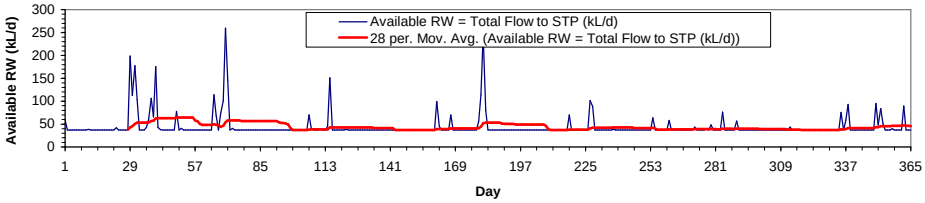


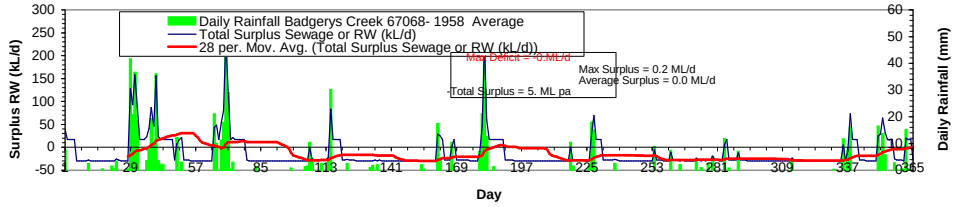
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 20 kL tank

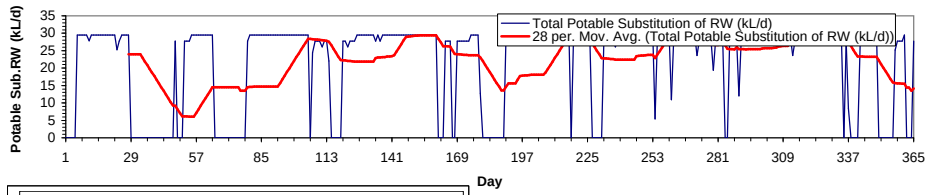


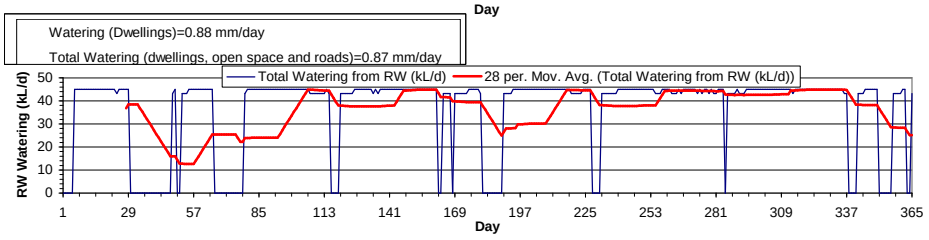


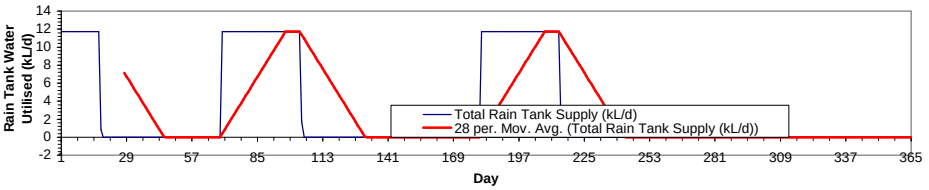
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 20 kL tank - Average Rainfall Year

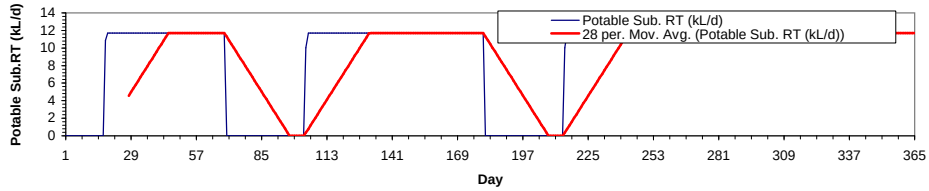


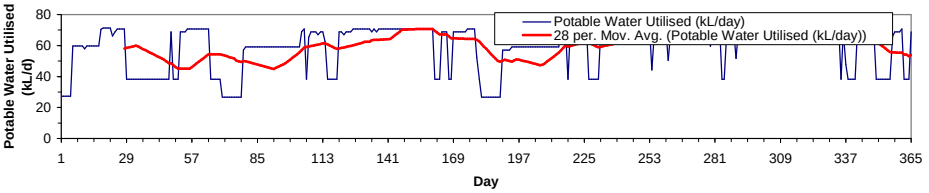


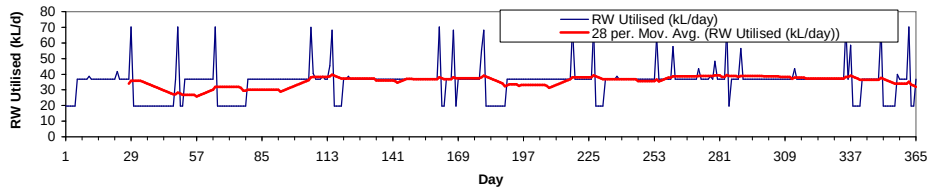




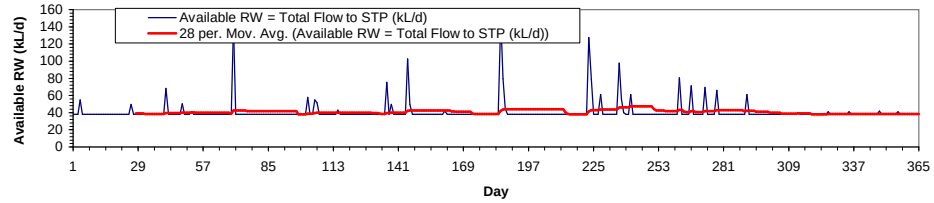


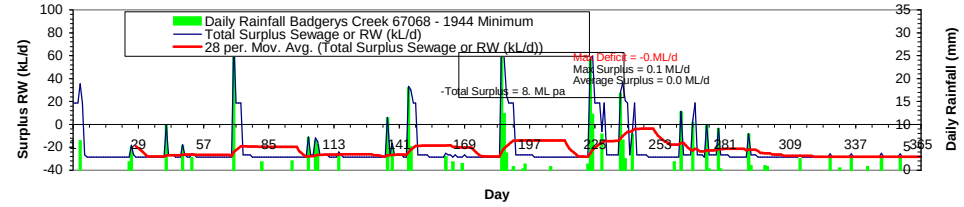


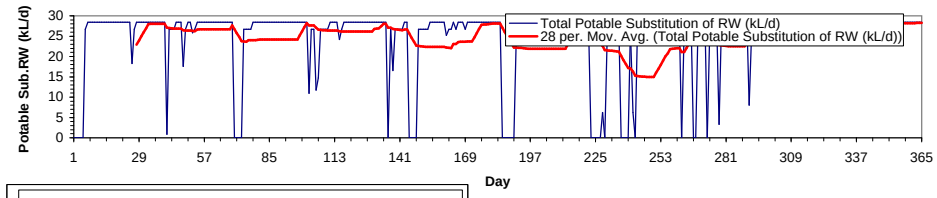


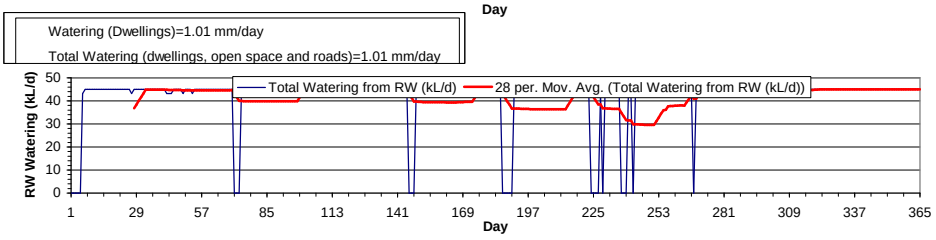


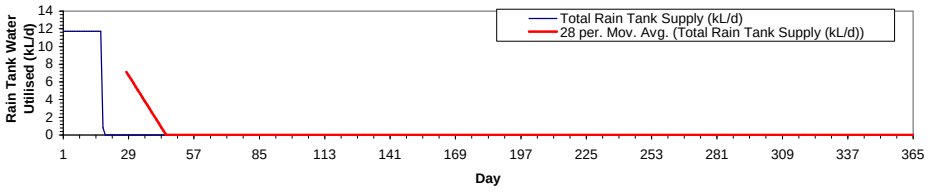
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 20 kL tank - Dry Rainfall Year

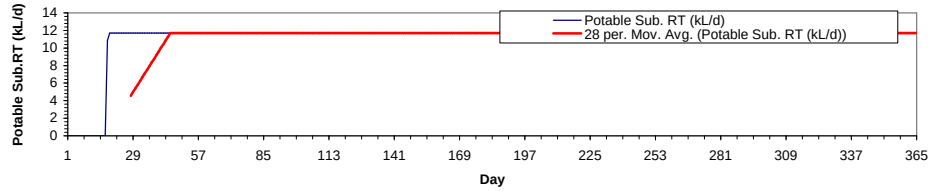


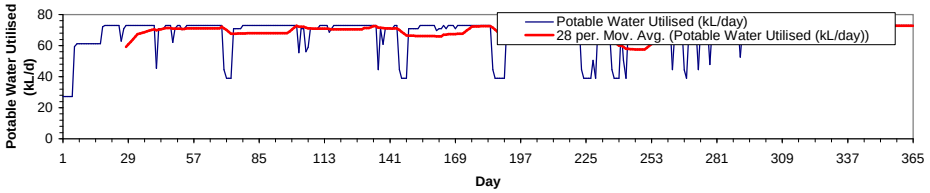


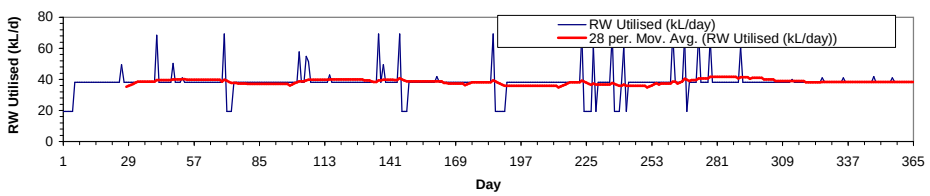




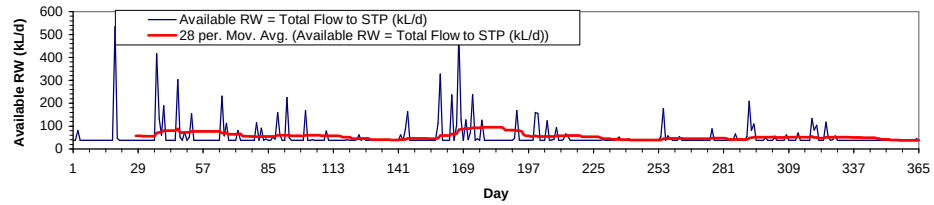


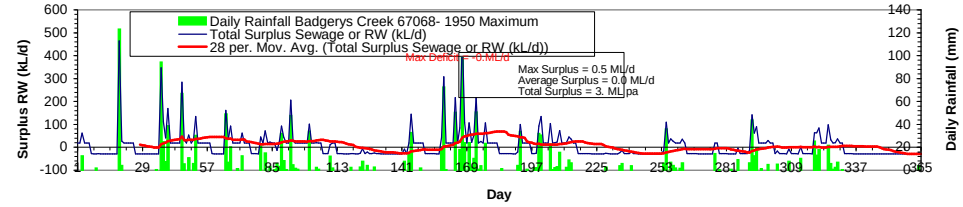


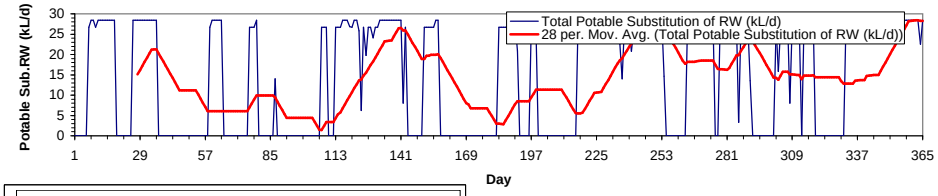


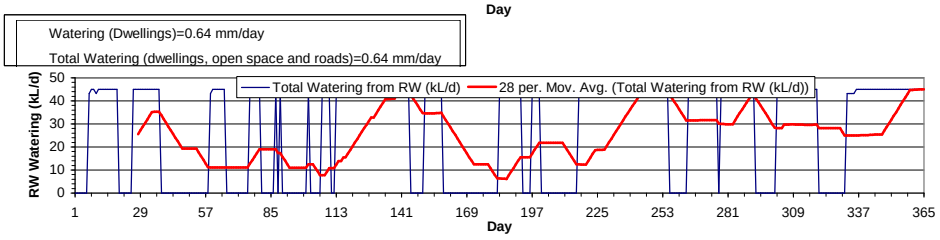


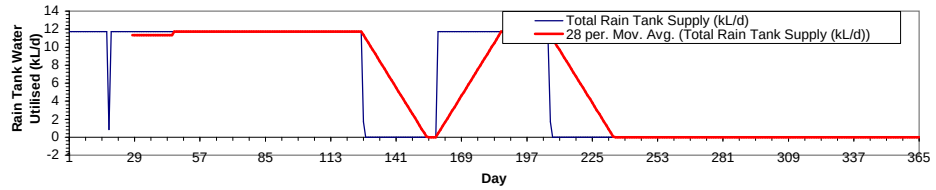
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 20 kL tank - Wet Rainfall Year

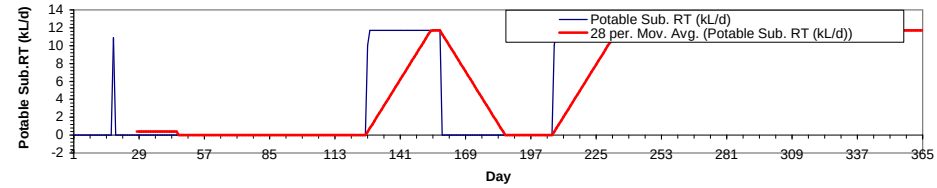


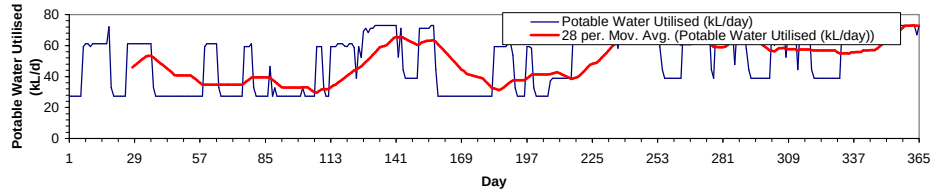


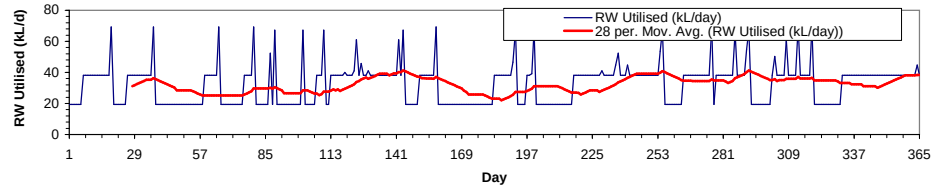




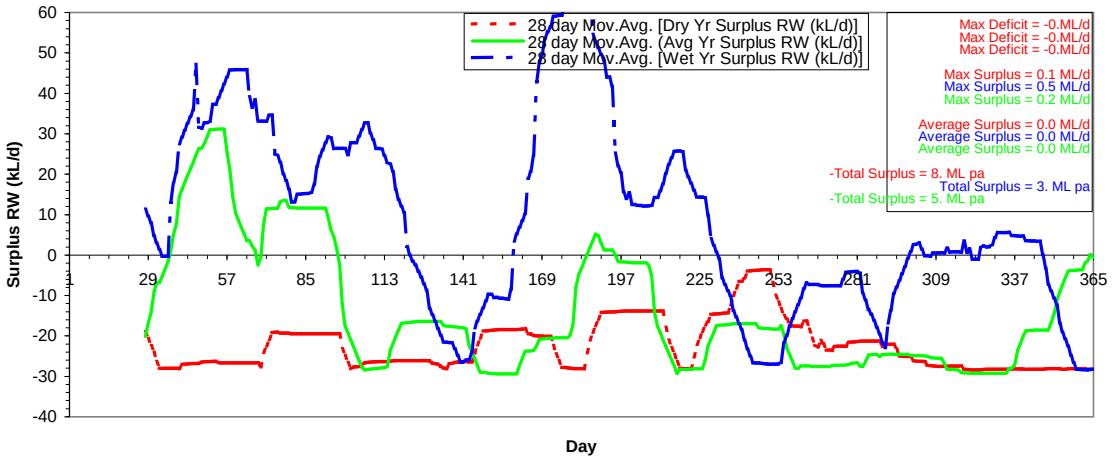


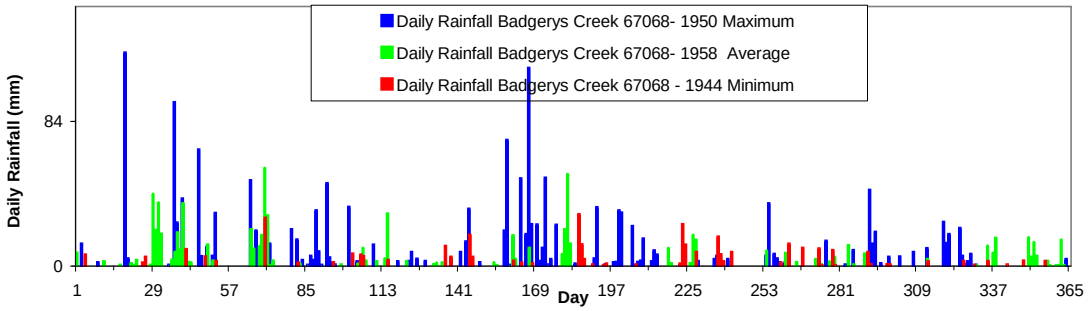




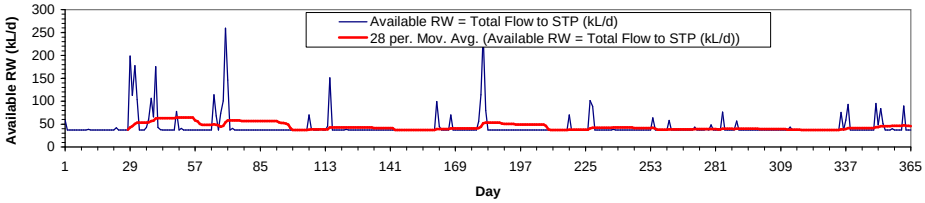


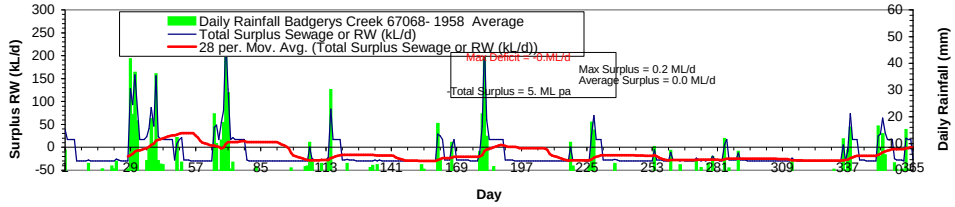
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 30 kL tank

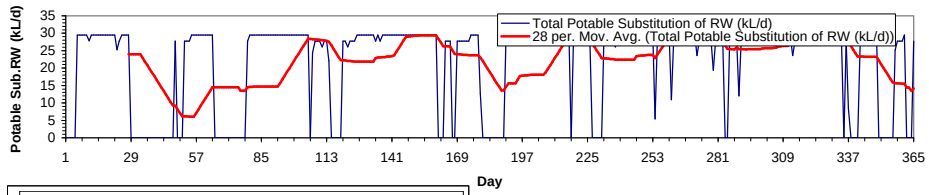


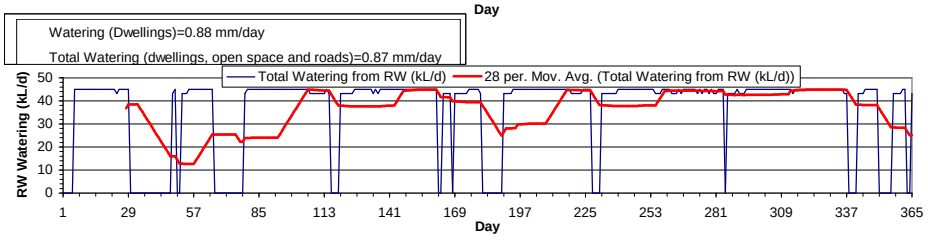


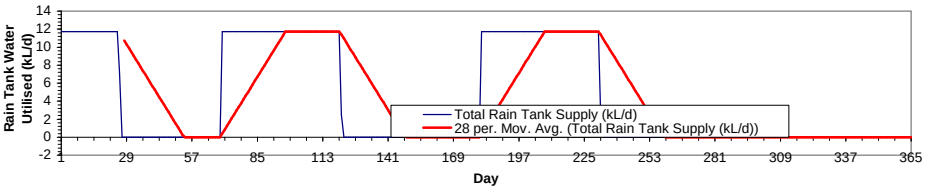
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 30 kL tank - Average Rainfall Year

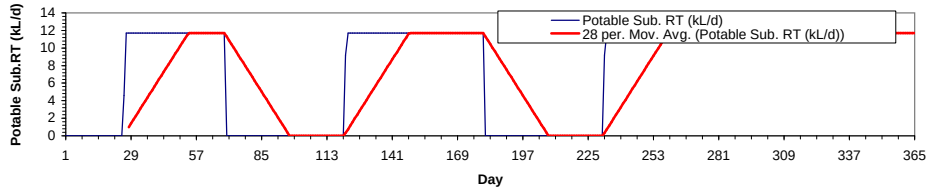


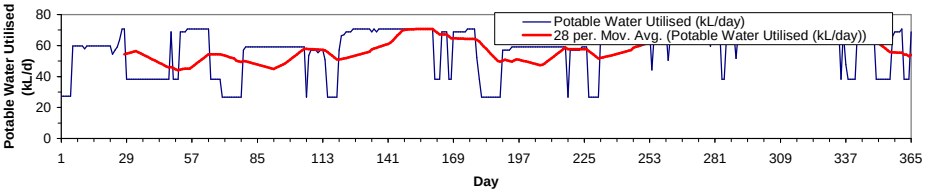


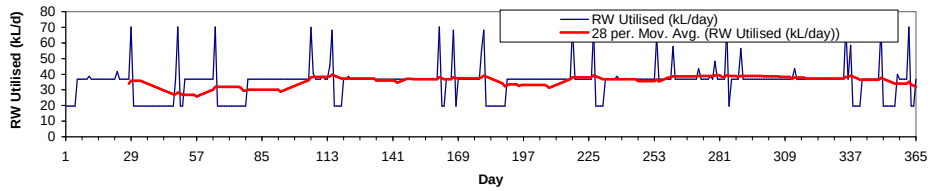




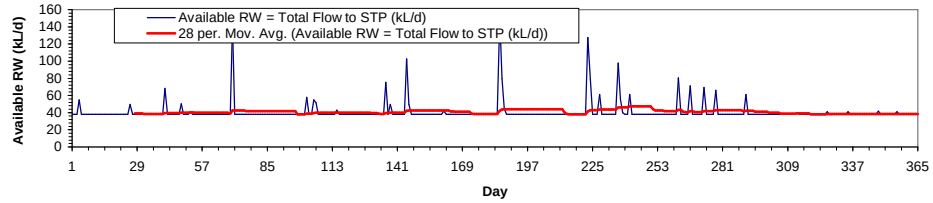


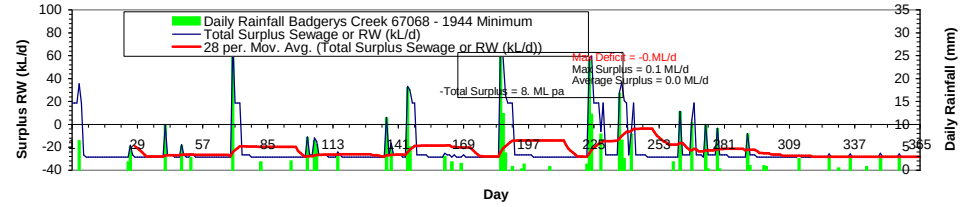


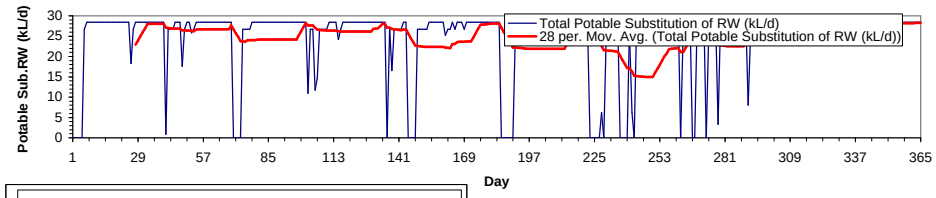


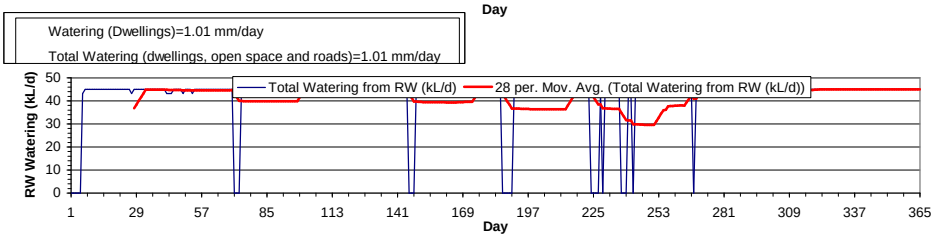


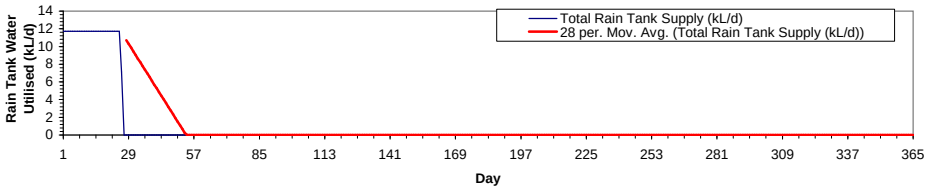
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 30 kL tank - Dry Rainfall Year

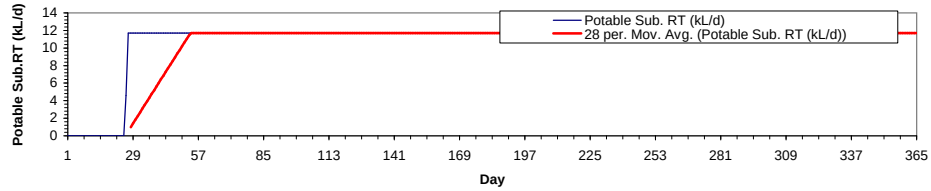


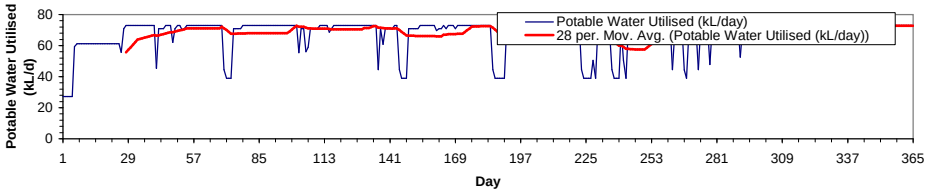


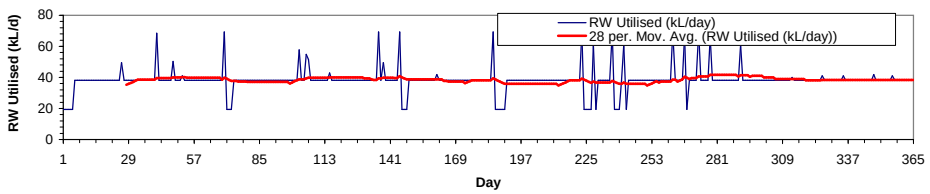




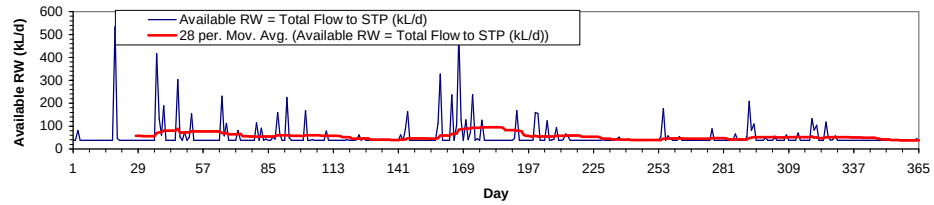


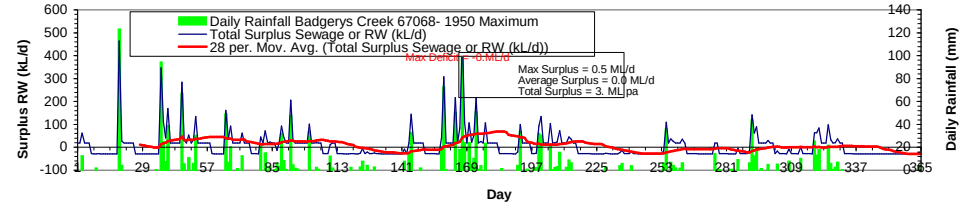


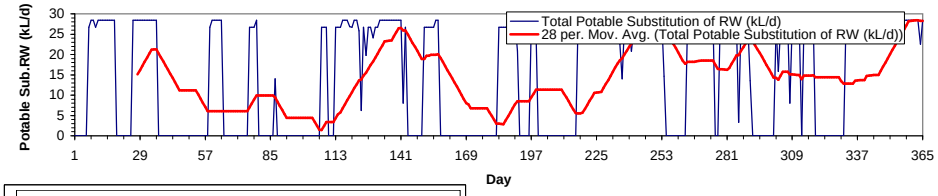


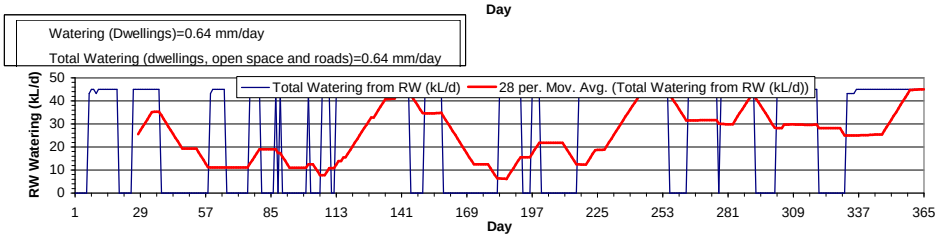


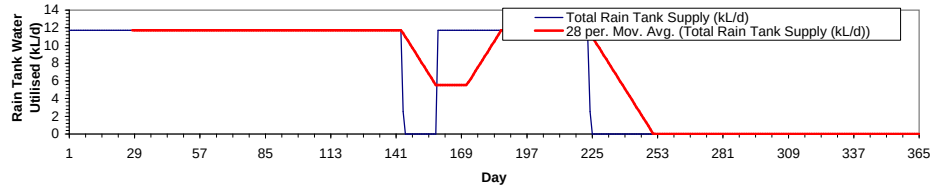
Scenario 3- Stage 1- Rainwater Tank servicing Toilet, 30 kL tank - Wet Rainfall Year

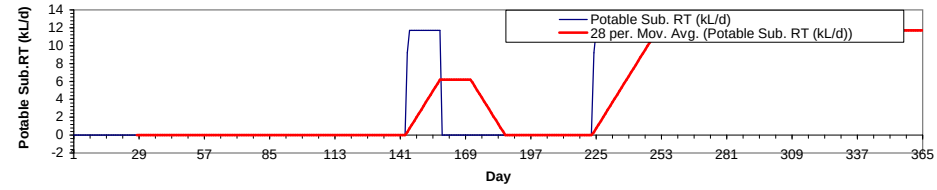


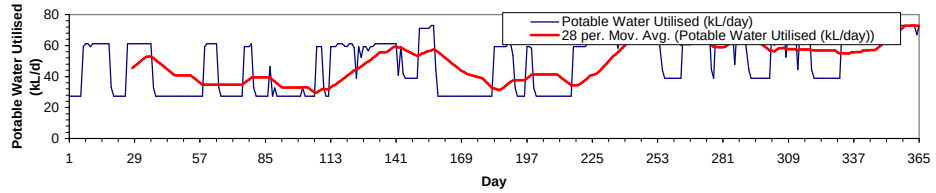


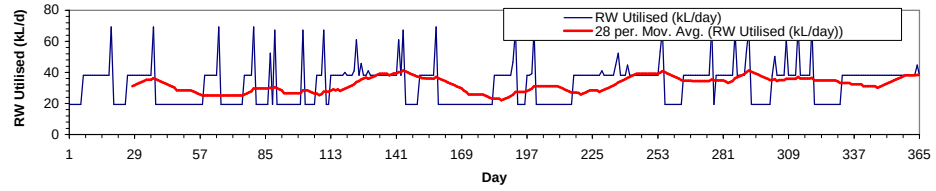




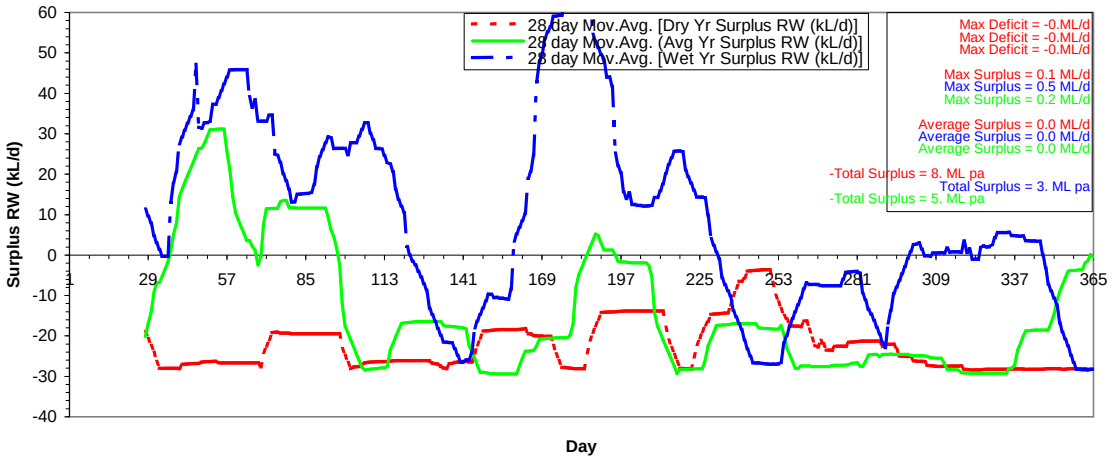


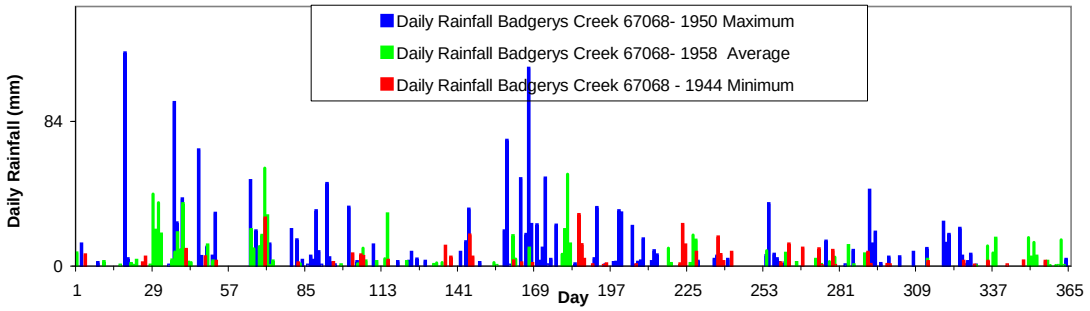




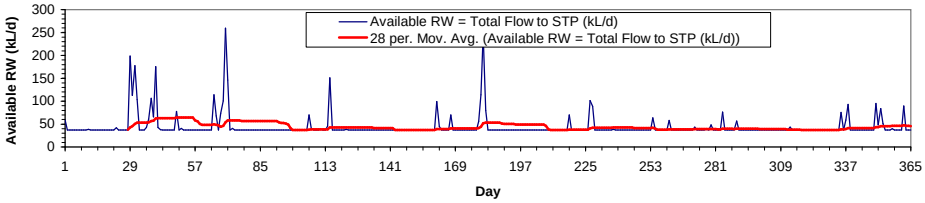


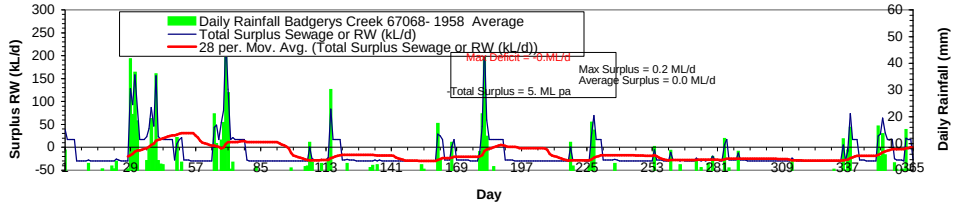
Scenario 4- Stage 1- Rainwater Tank servicing Toilet, 15 kL tank

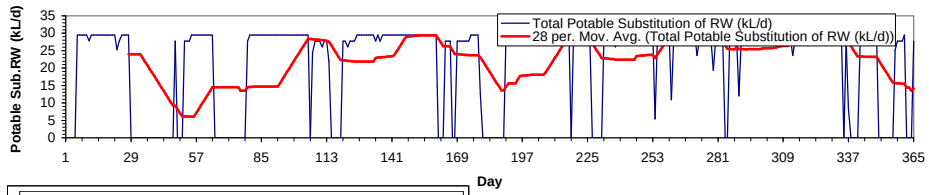


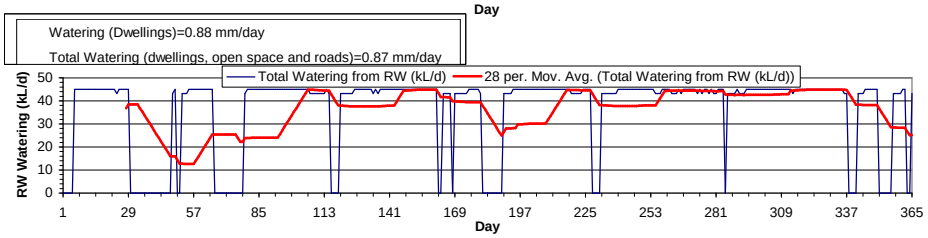


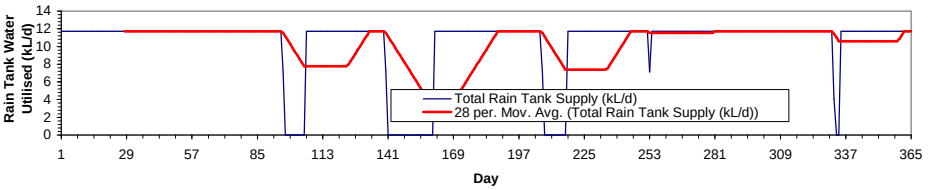
Scenario 4- Stage 1- Rainwater Tank servicing Toilet, 15 kL tank - Average Rainfall Year

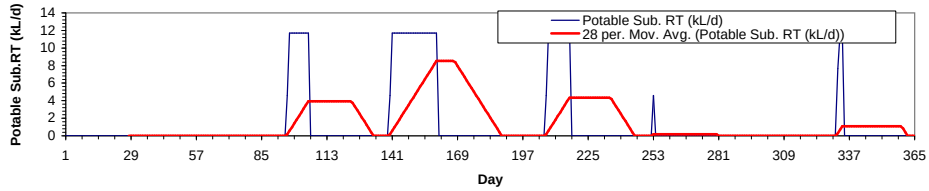


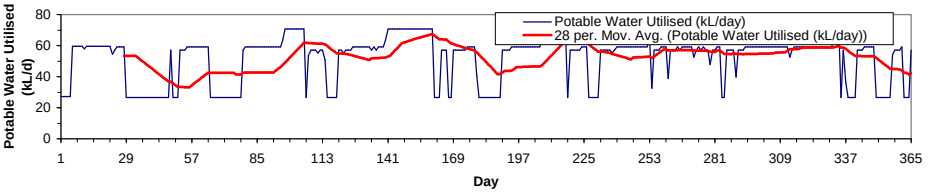


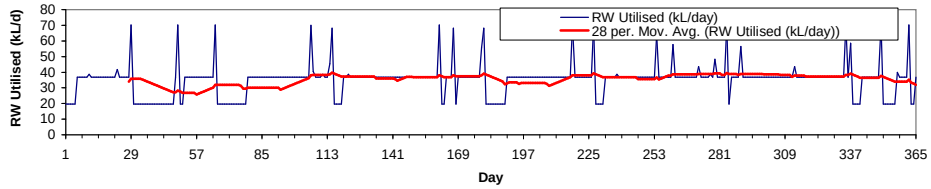




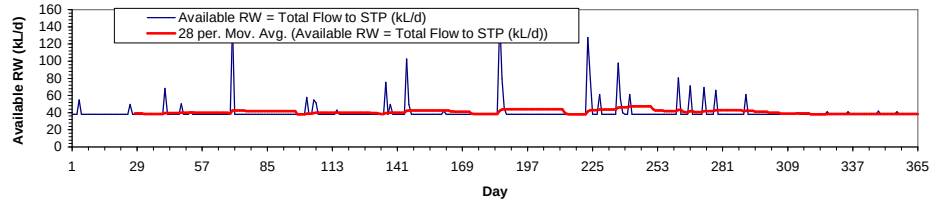


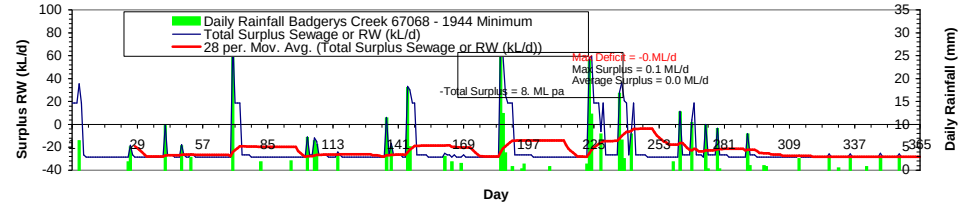


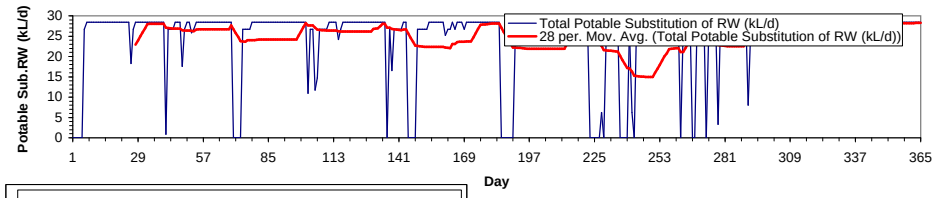


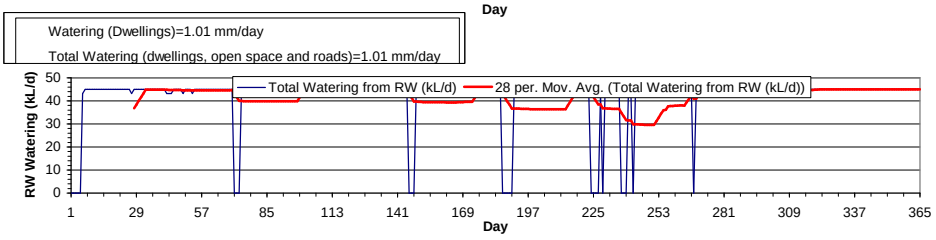


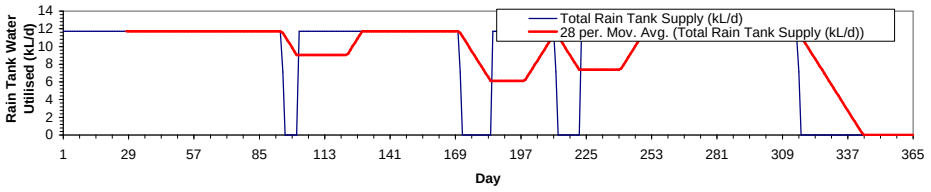
Scenario 4- Stage 1- Rainwater Tank servicing Toilet, 30 kL tank - Dry Rainfall Year

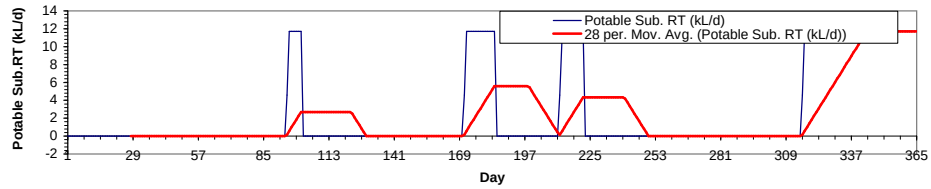


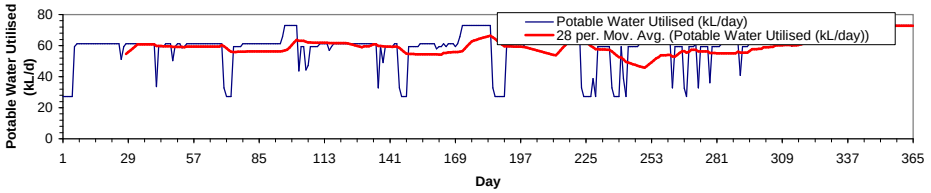


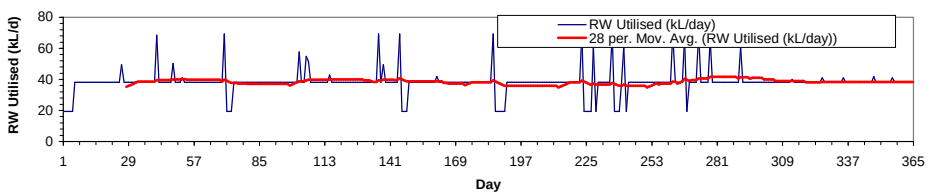




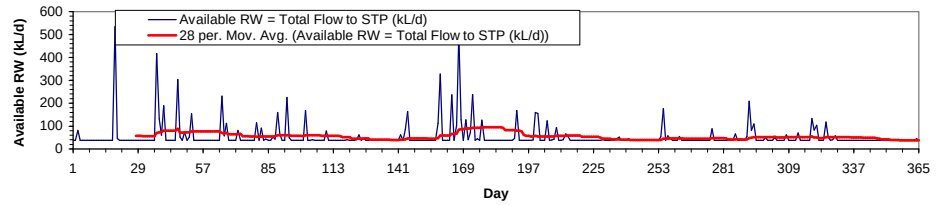


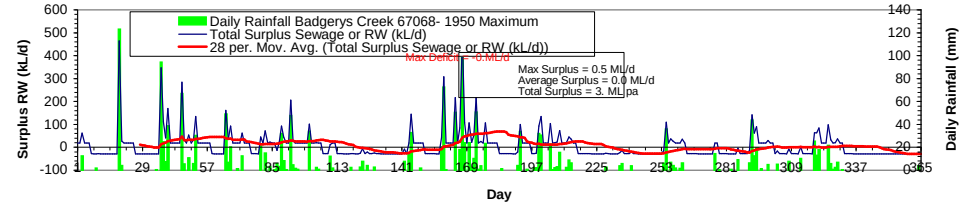


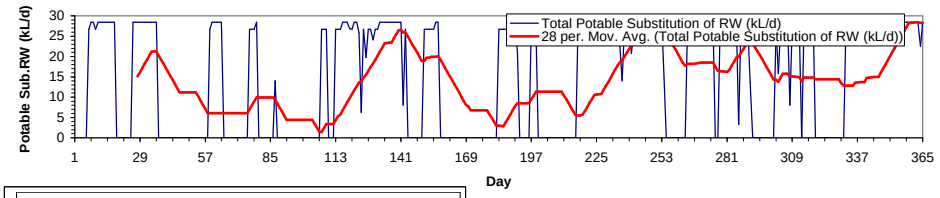


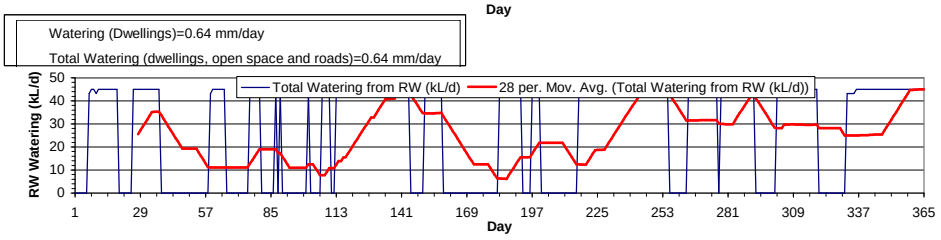


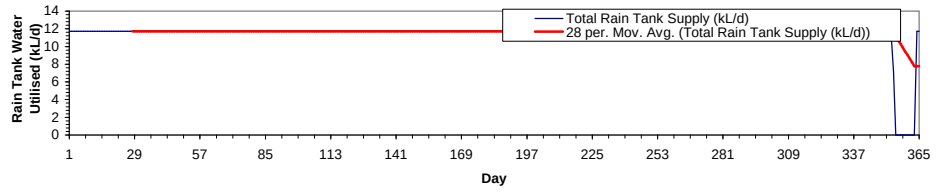
Scenario 4- Stage 1- Rainwater Tank servicing Toilet, 15 kL tank - Wet Rainfall Year

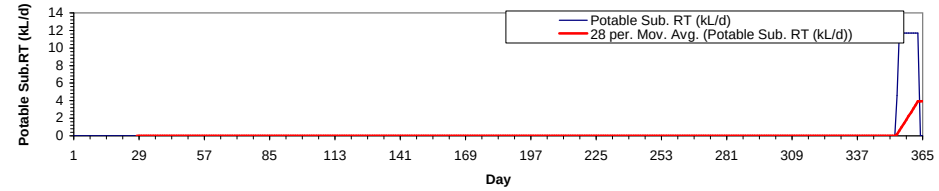


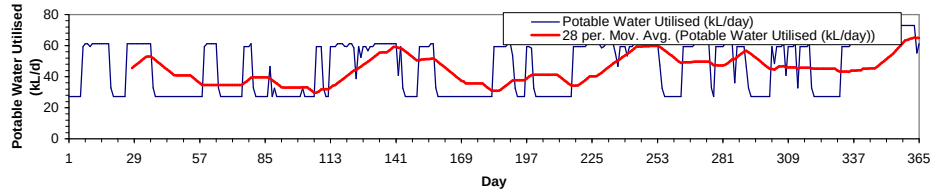


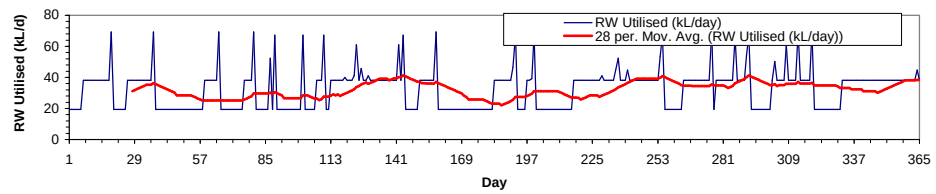




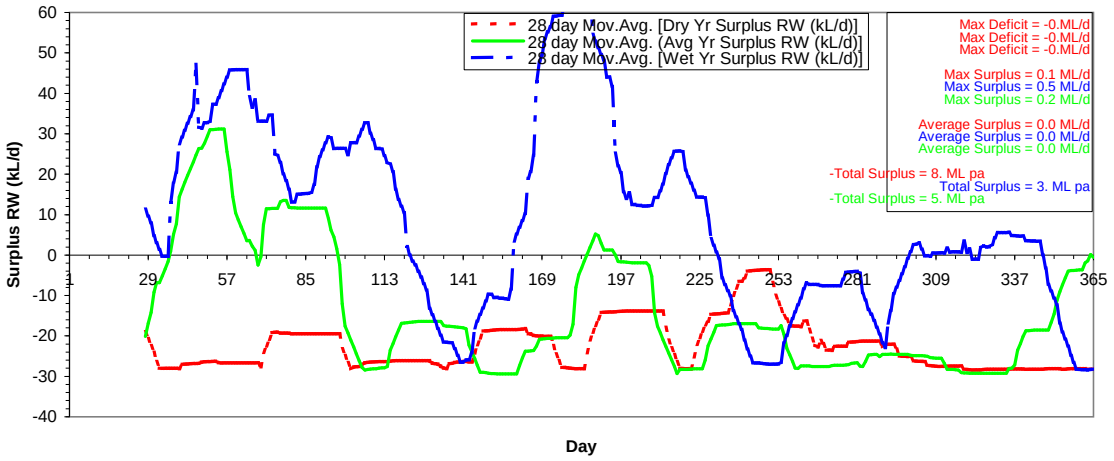


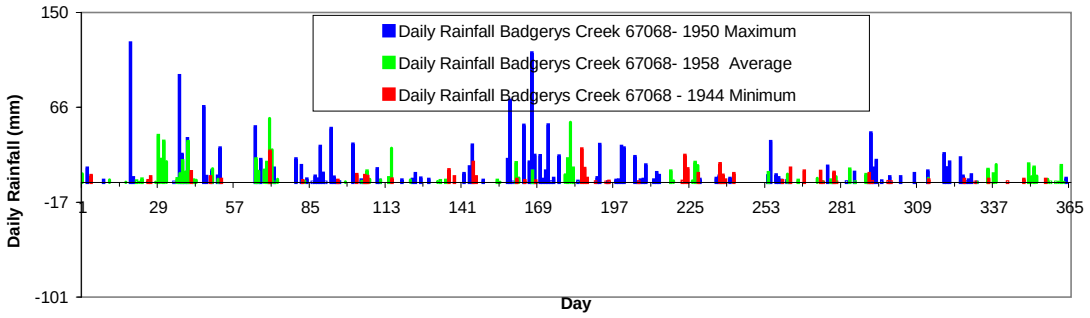




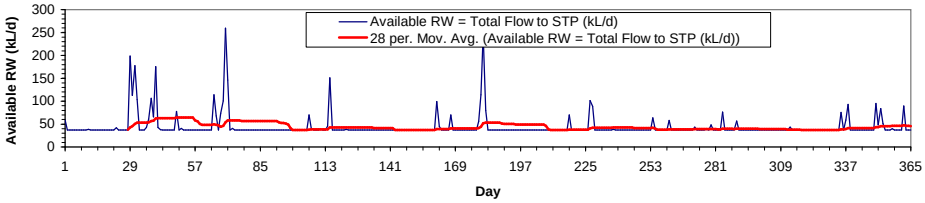


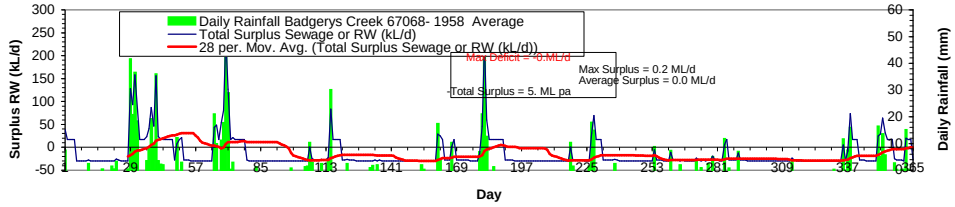
Scenario 4- Stage 1- Rainwater tanks for Toilet end uses, 20kL

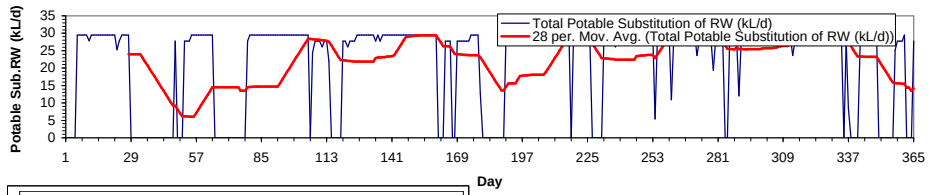


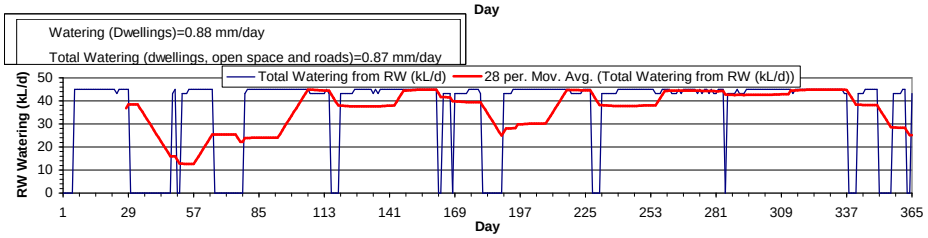


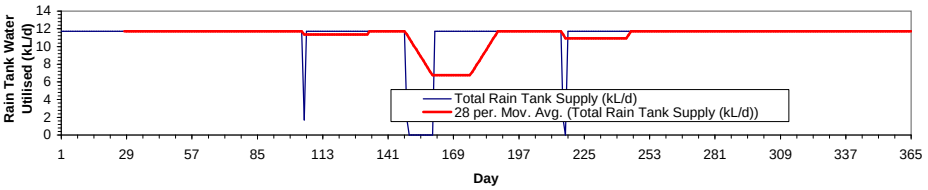
Scenario 4- Stage 1- Rainwater tanks for Toilet end uses, 20kL- Average Rainfall Year

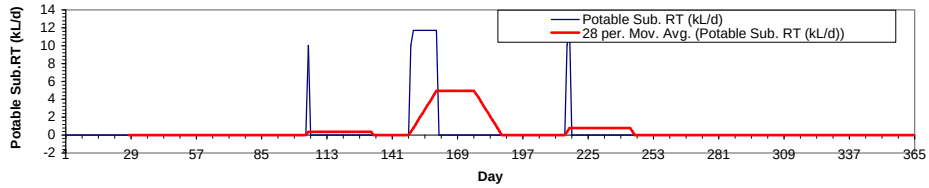


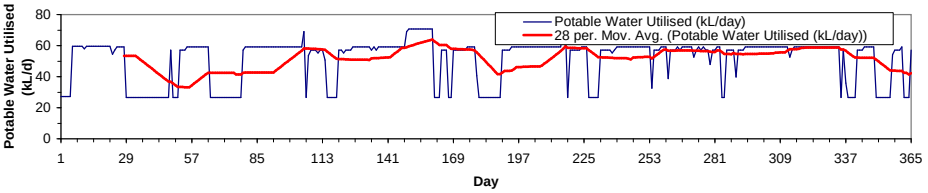


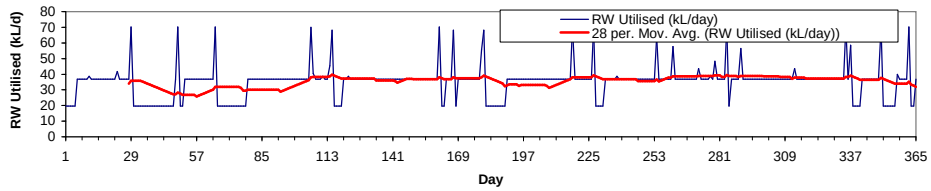




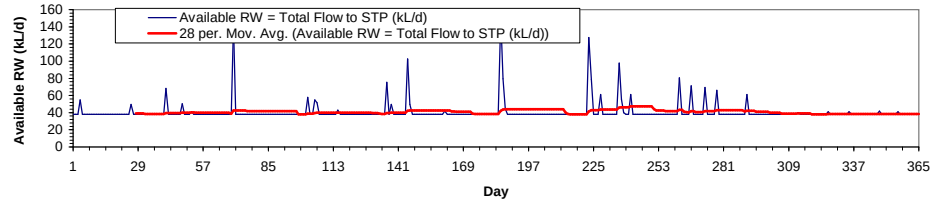


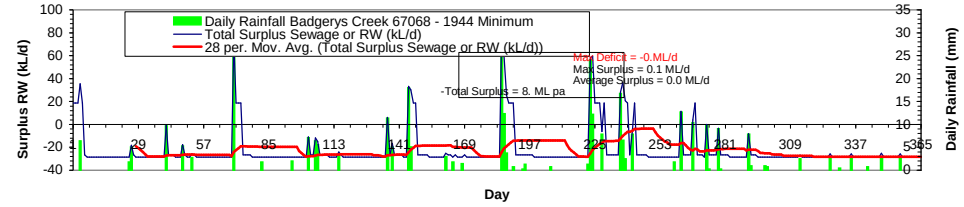


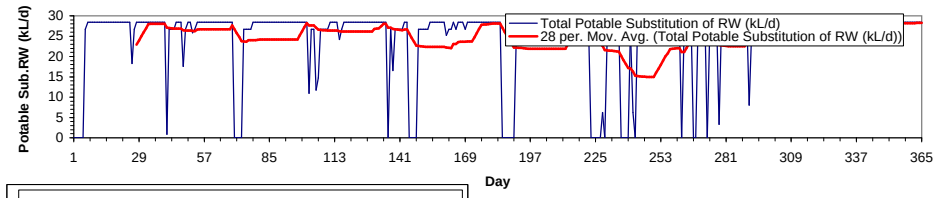


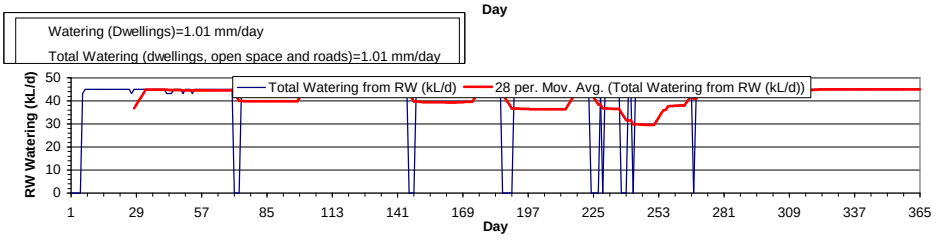


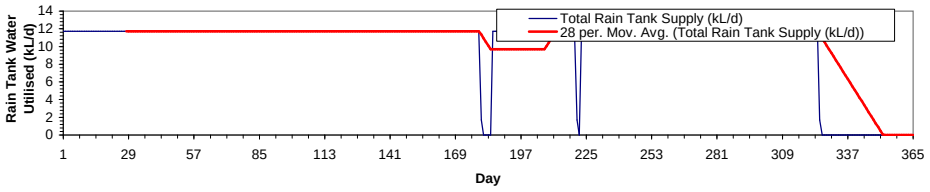
Scenario 4- Stage 1- Rainwater tanks for Toilet end uses, 20kL- Dry Rainfall Year

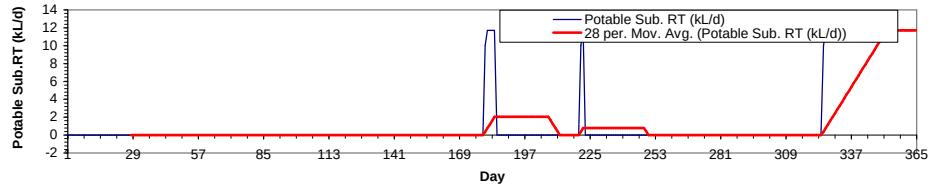


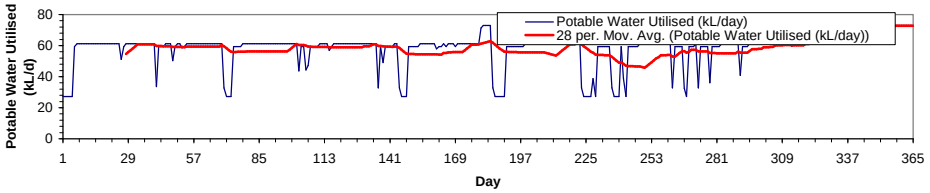


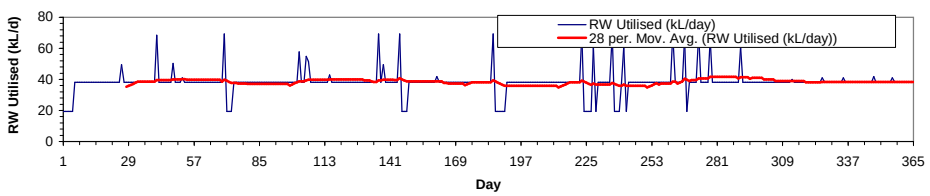




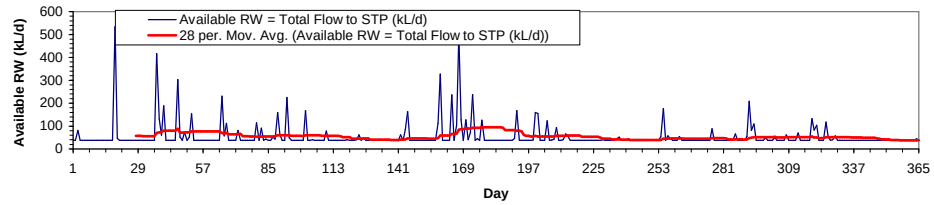


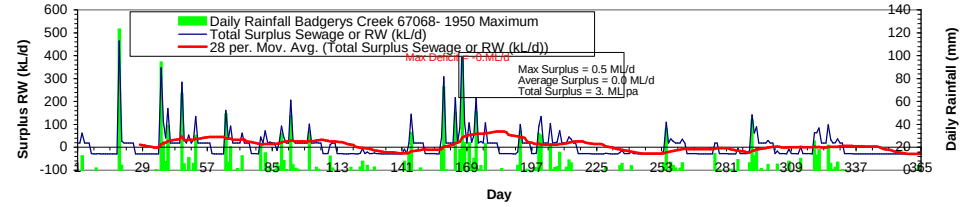


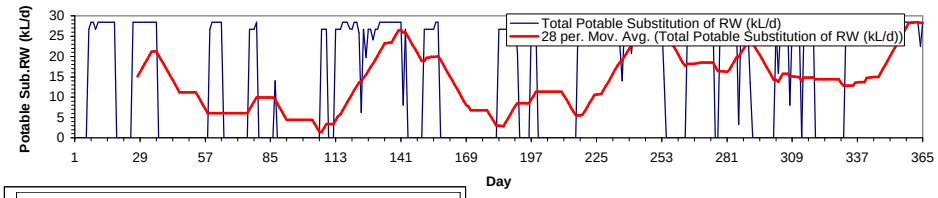


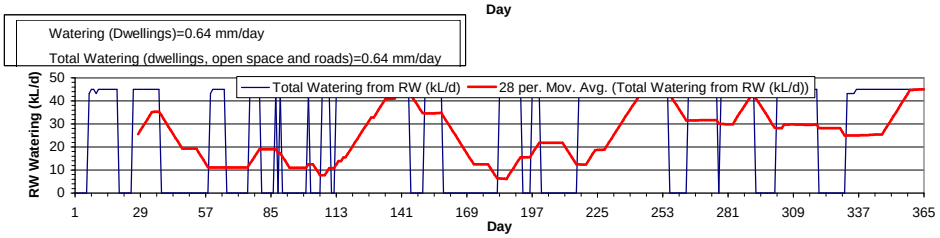


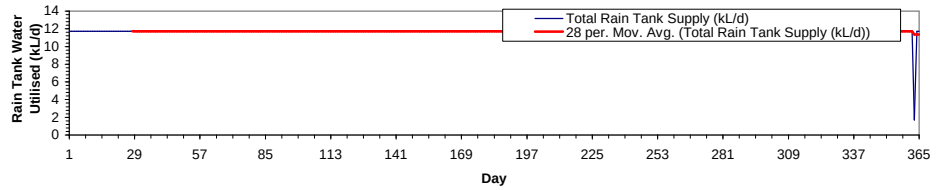
Scenario 4- Stage 1- Rainwater tanks for Toilet end uses, 20kL- Wet Rainfall Year

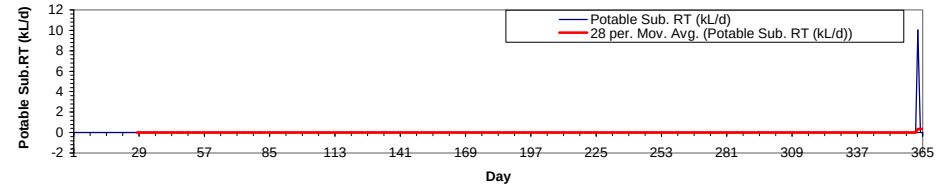


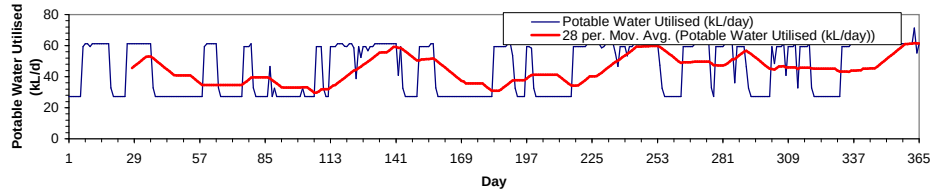


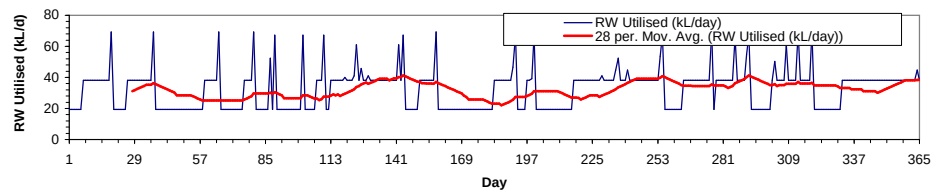




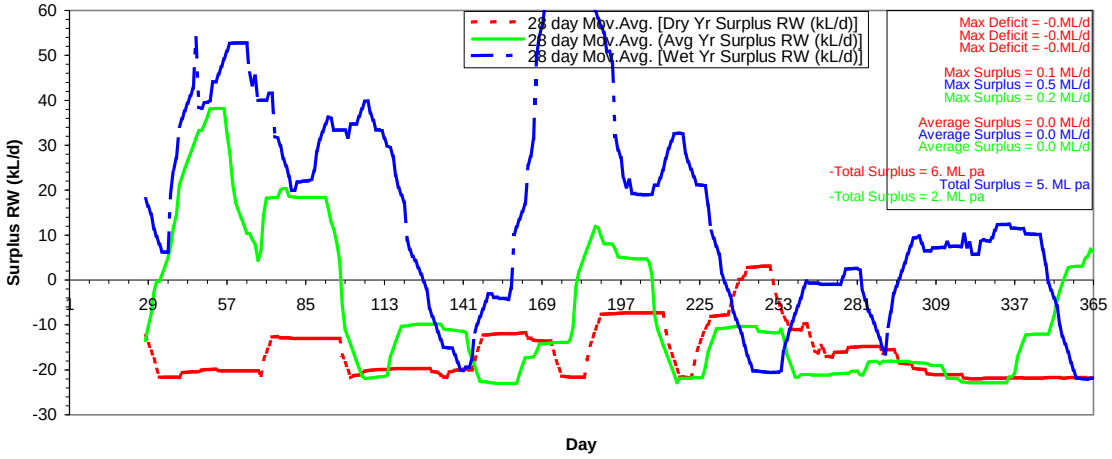


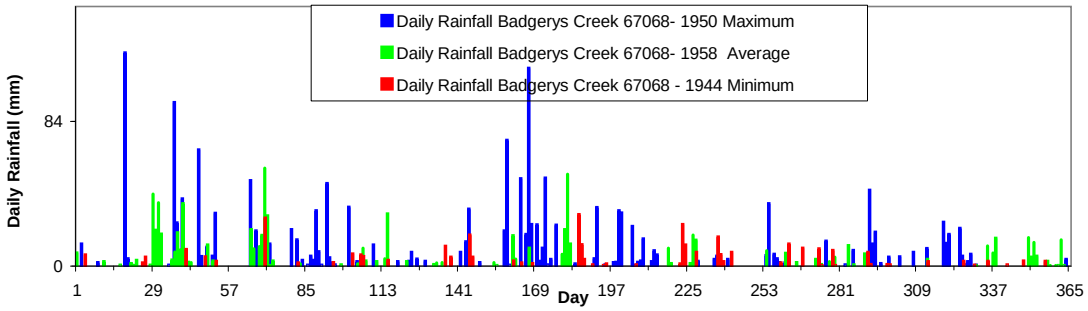




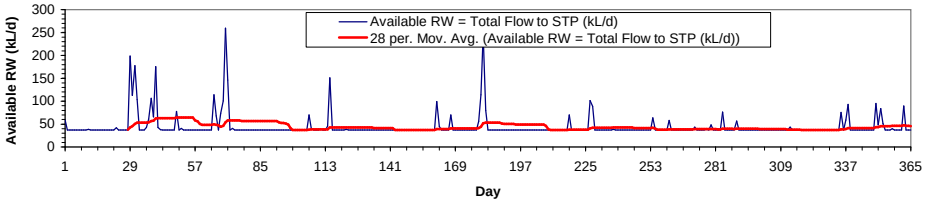


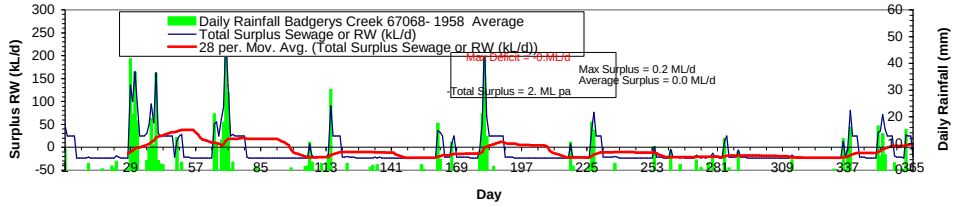
Scenario 4- Stage 1- Rainwater tanks for toilets and car washing, 20kL

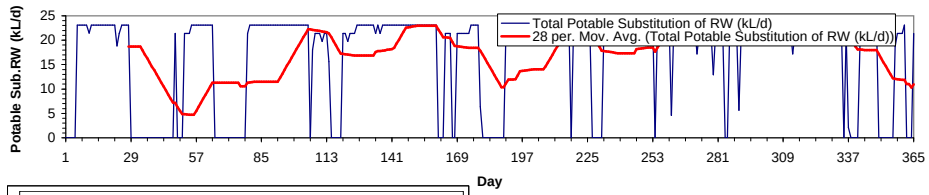


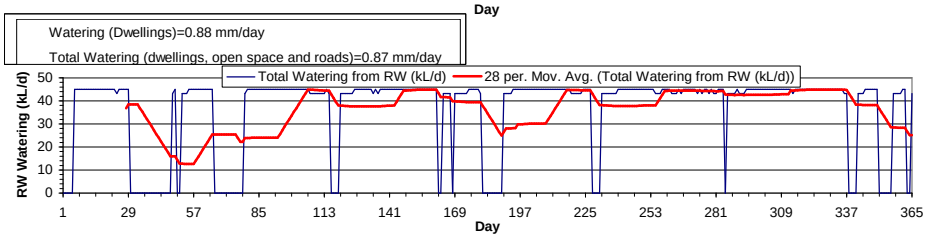


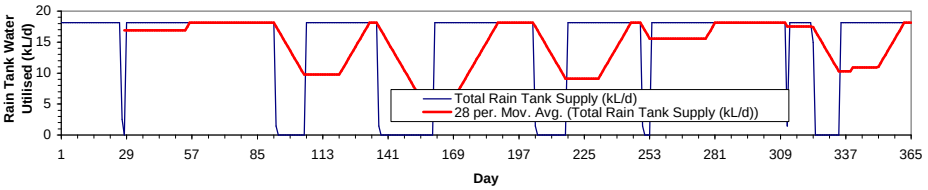
Scenario 4- Stage 1- Rainwater tanks for toilets and car washing, 20kL - Average Rainfall Year

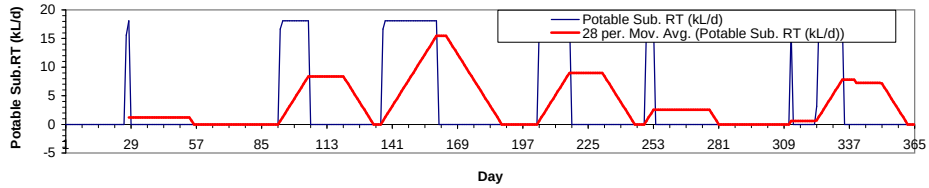


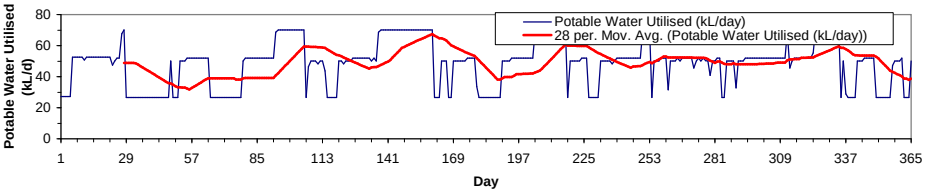


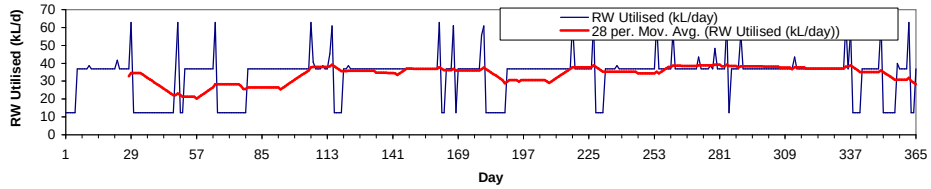




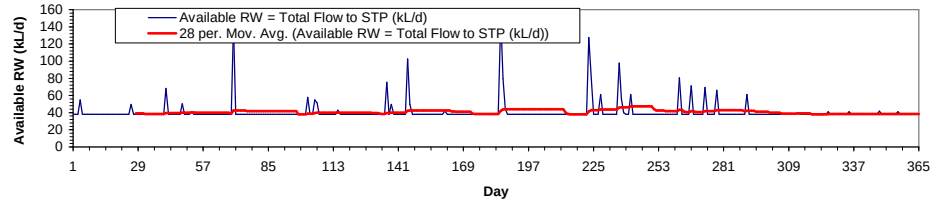


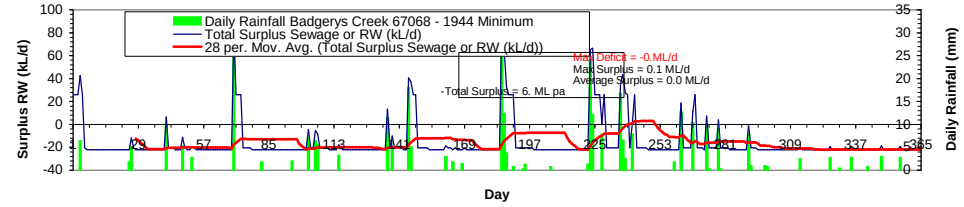


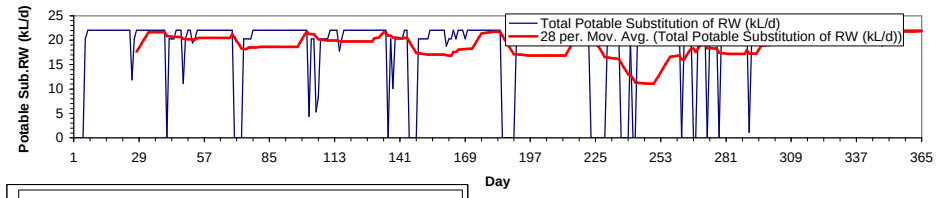


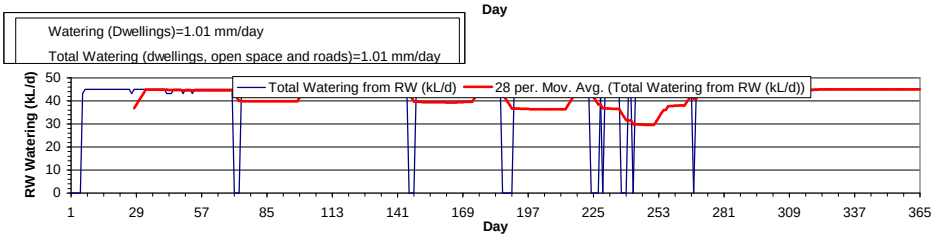


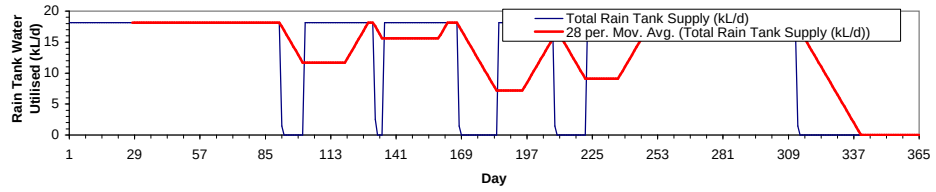
Scenario 4- Stage 1- Rainwater tanks for toilets and car washing, 20kL - Dry Rainfall Year

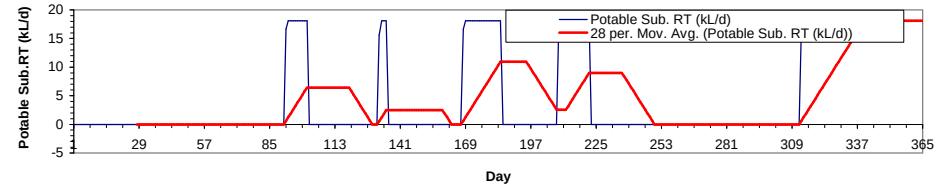


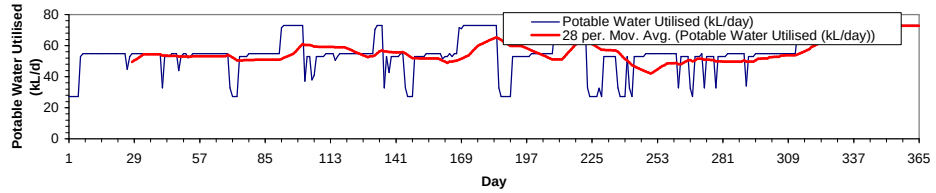


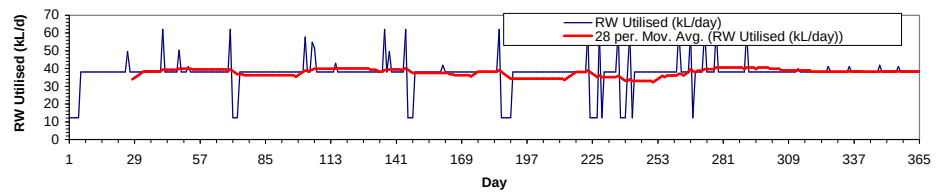




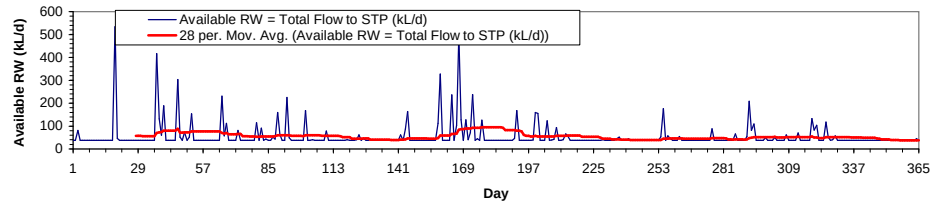


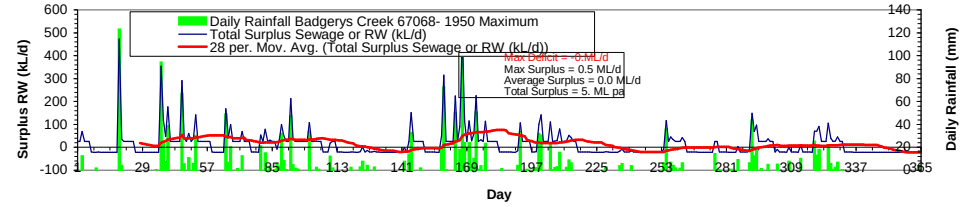


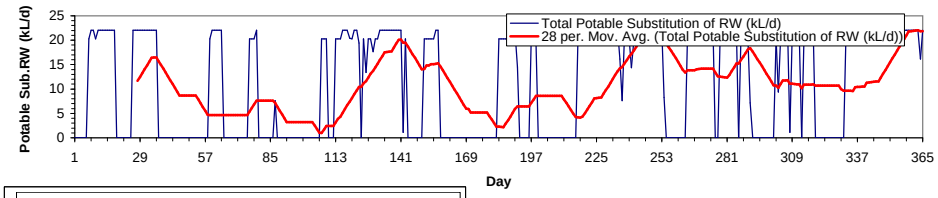


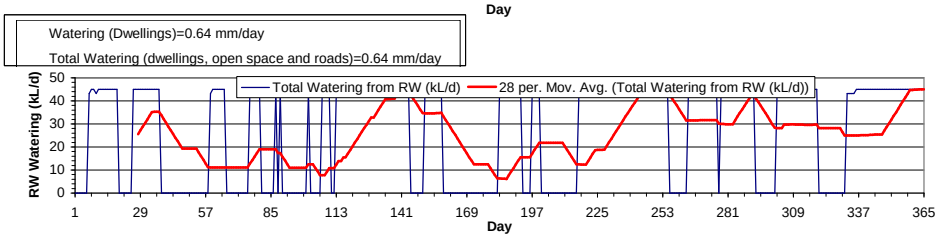


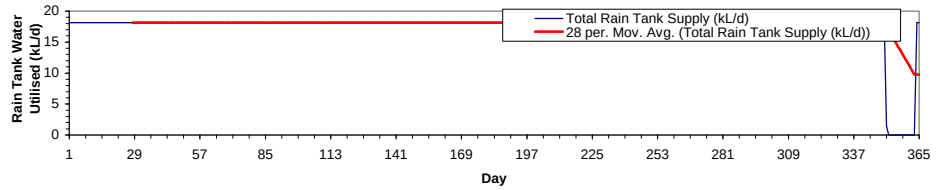
Scenario 4- Stage 1- Rainwater tanks for toilets and car washing, 20kL - Wet Rainfall Year

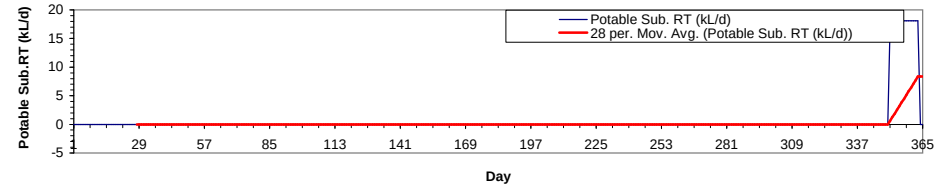


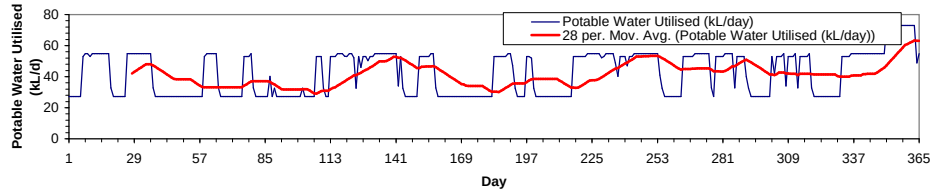


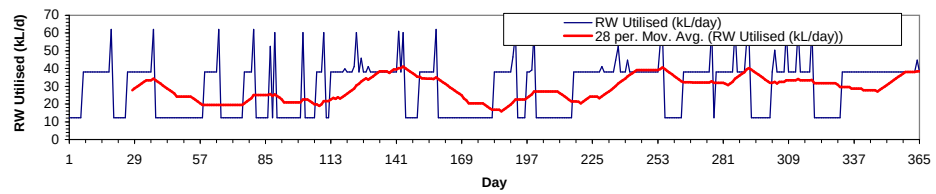




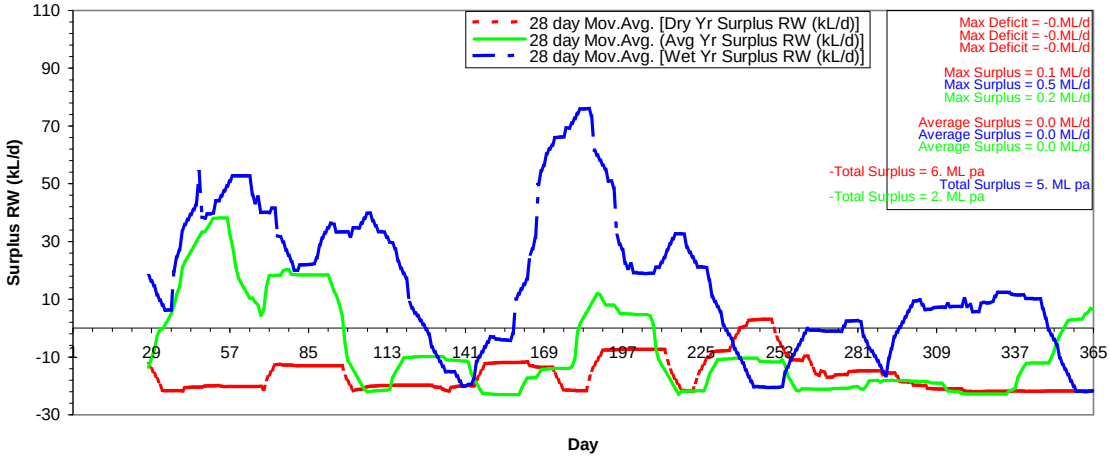


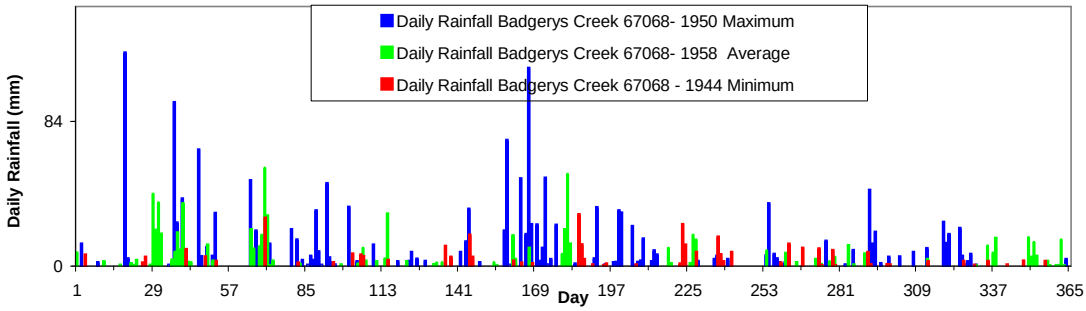




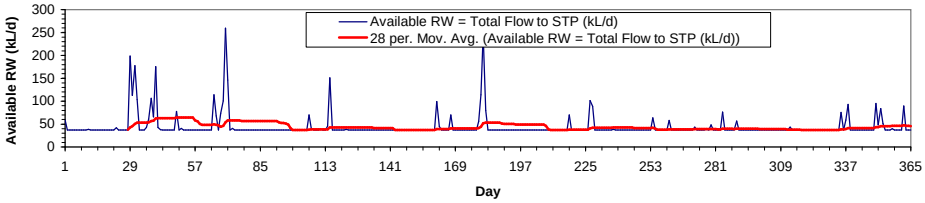


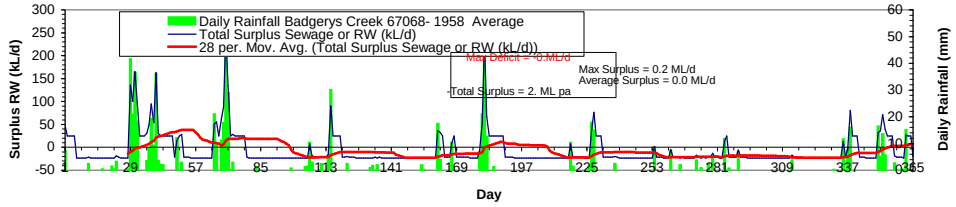
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 25kL tank

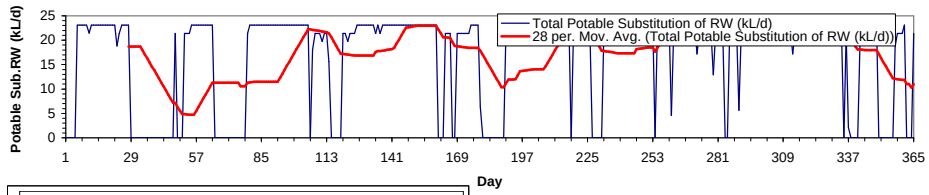


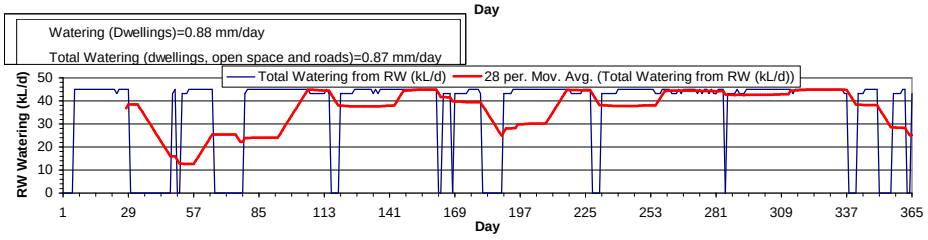


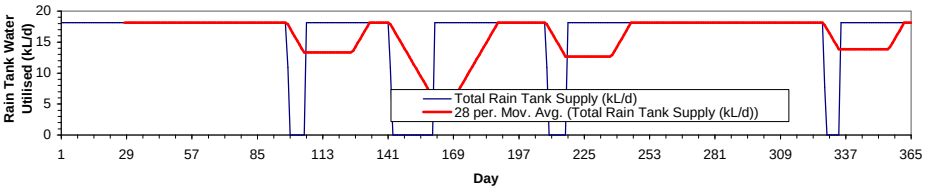
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 25kL tank - Average Rainfall Year

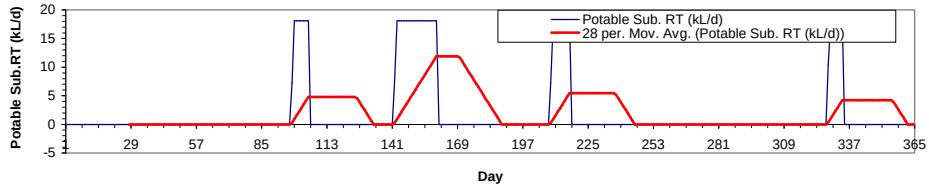


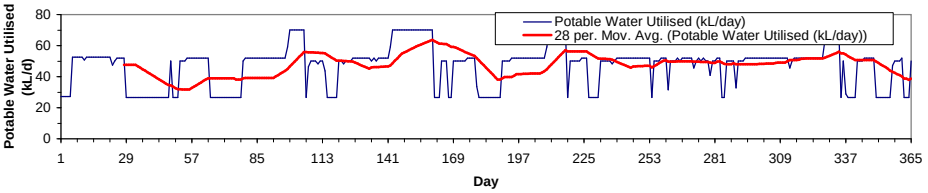


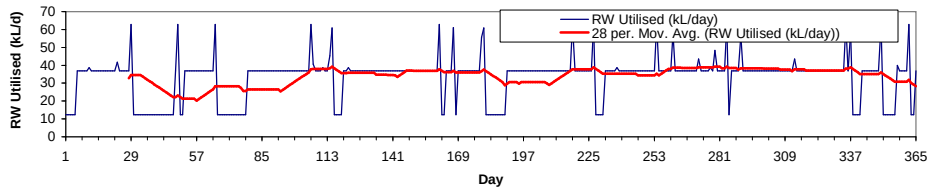




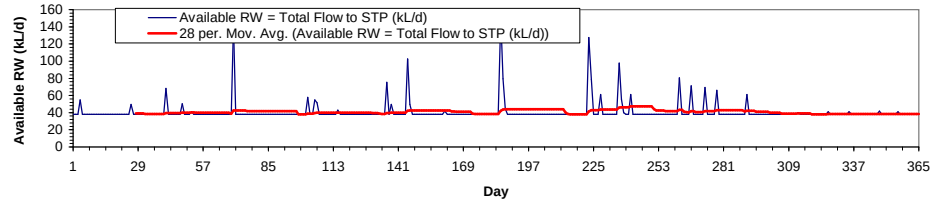


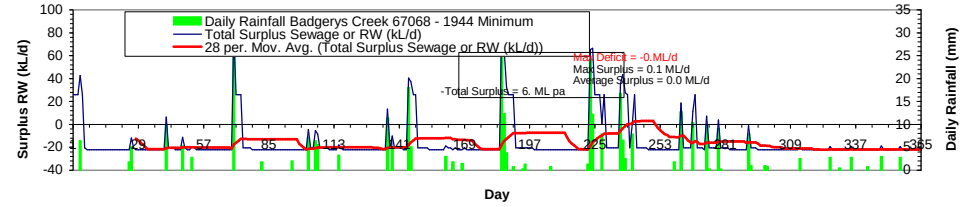


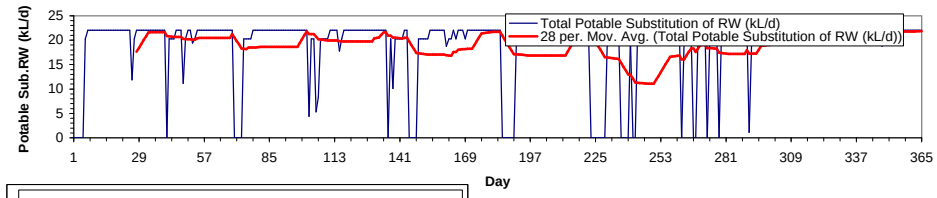


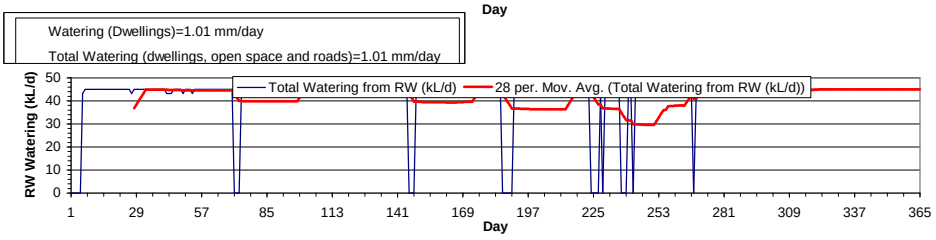


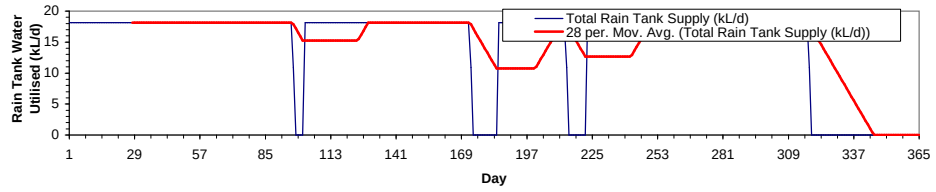
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 25kL tank - Dry Rainfall Year

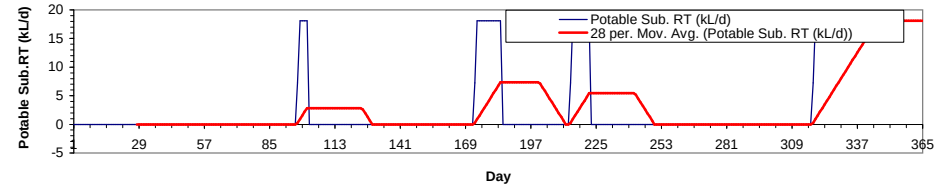


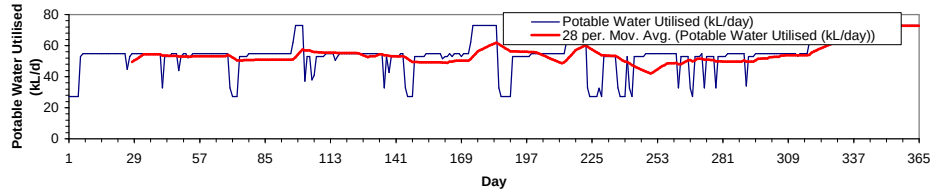


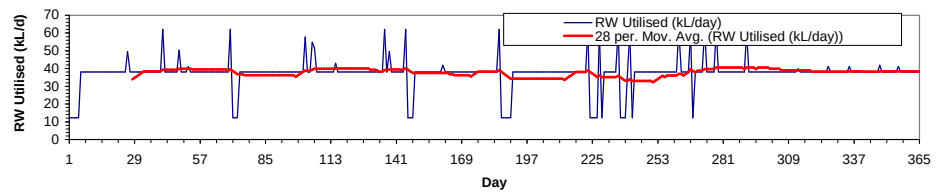




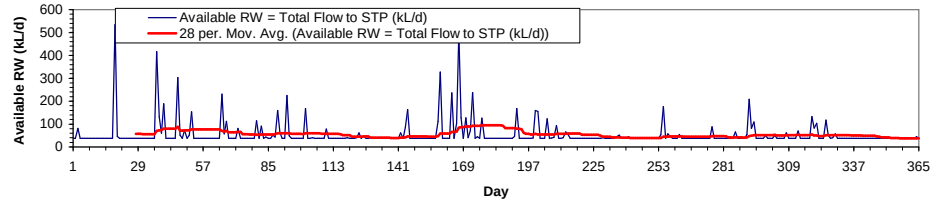


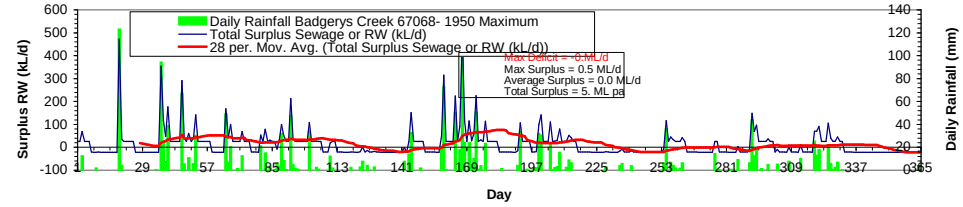


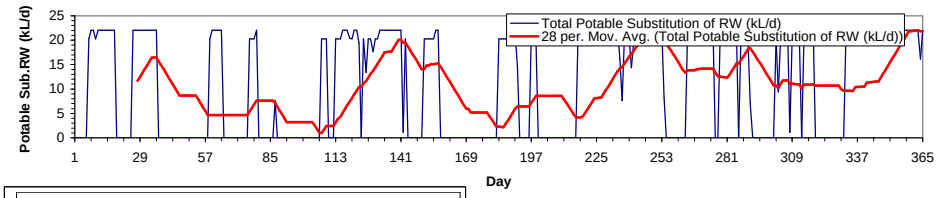


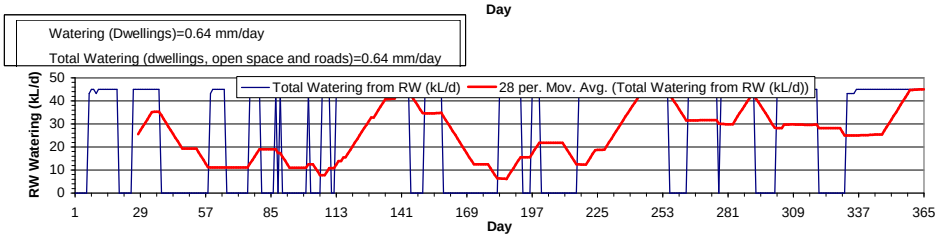


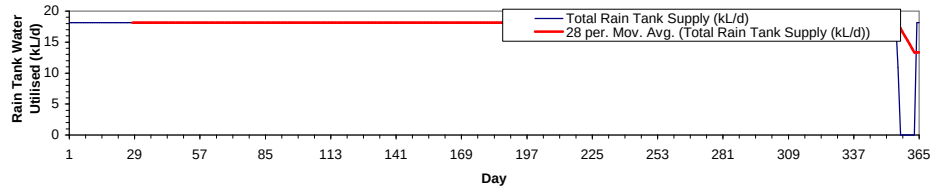
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 25kL tank - Wet Rainfall Year

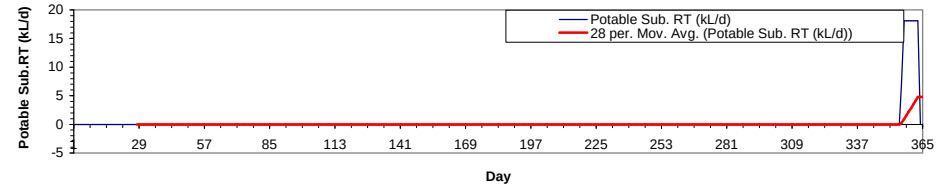


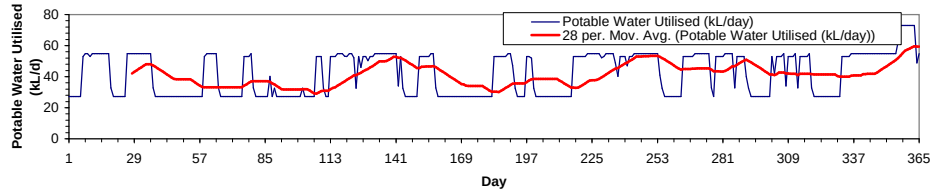


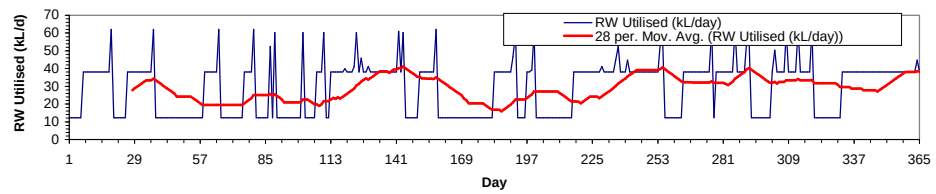




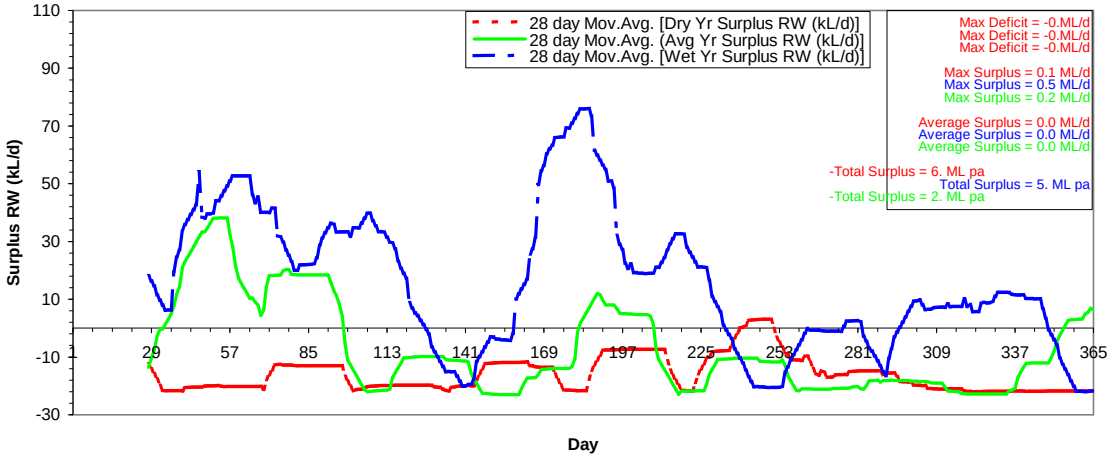


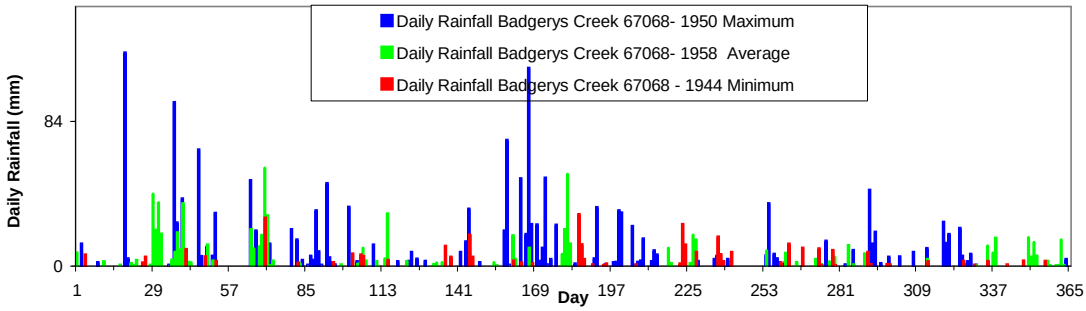




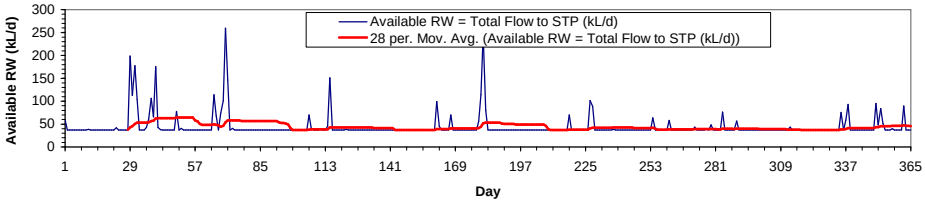


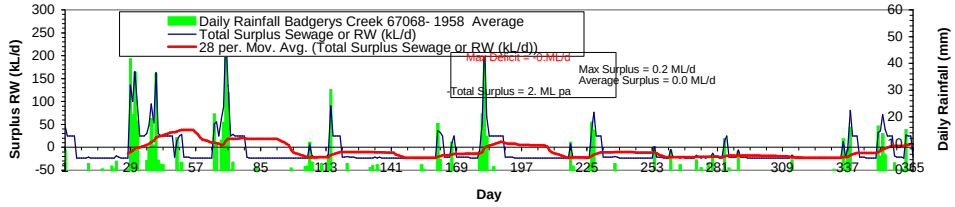
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 30kL tank

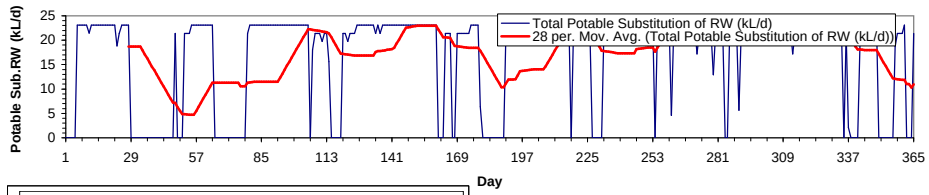


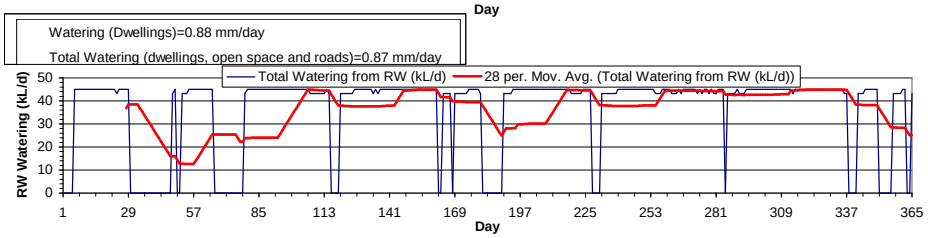


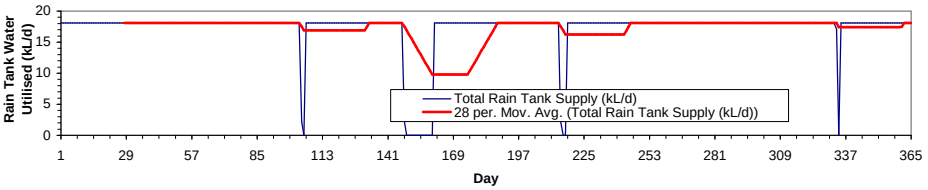
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 30kL tank - Average Rainfall Year

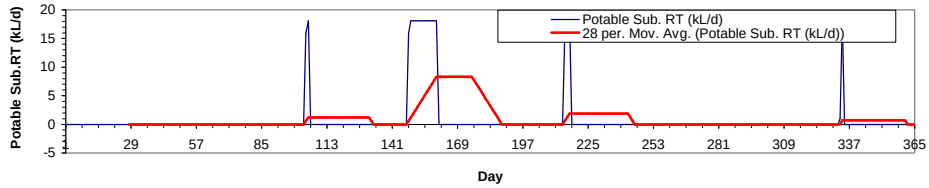


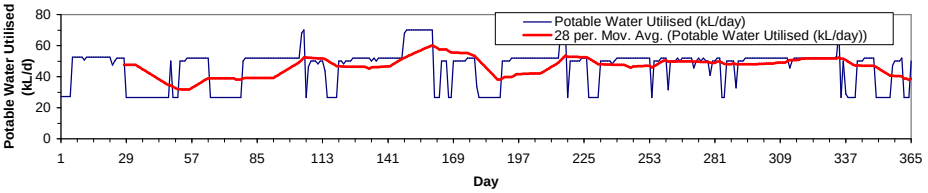


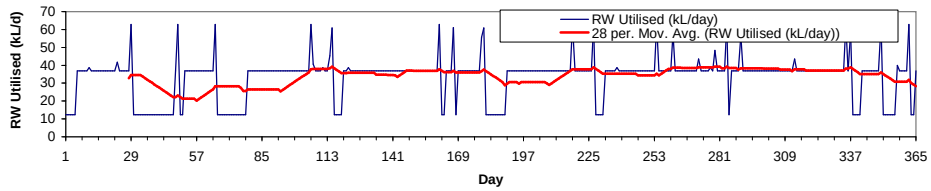




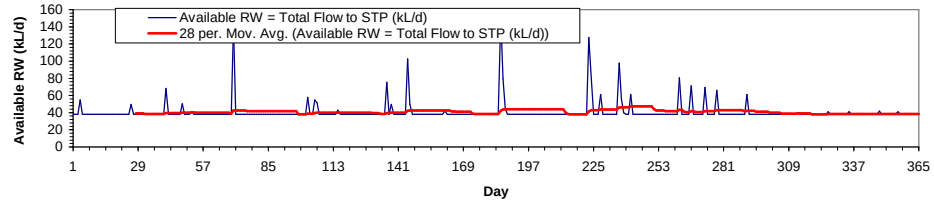


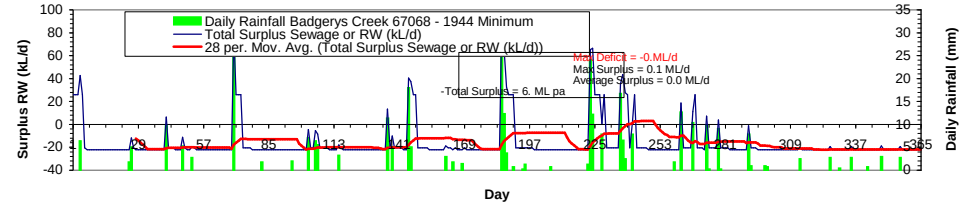


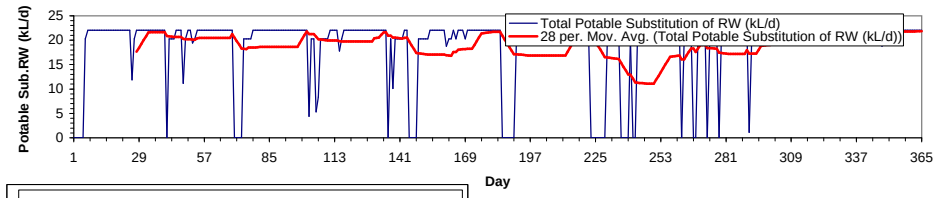


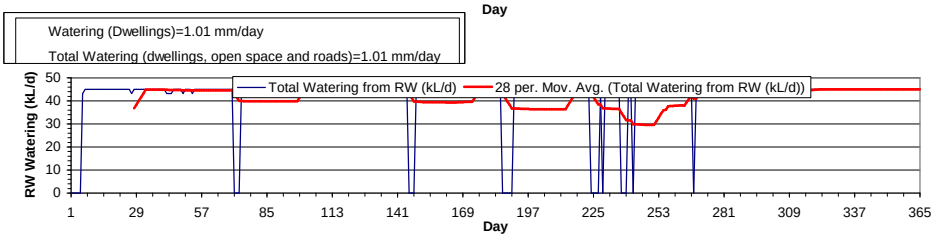


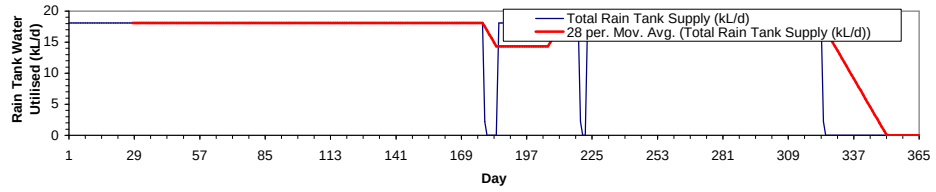
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 30kL tank - Dry Rainfall Year

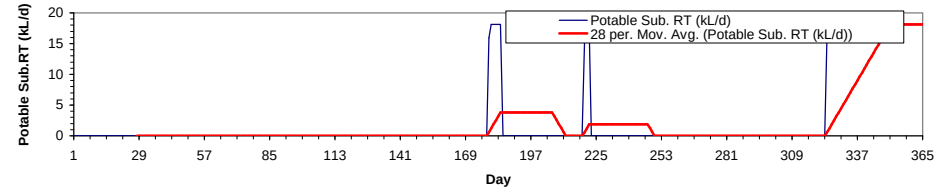


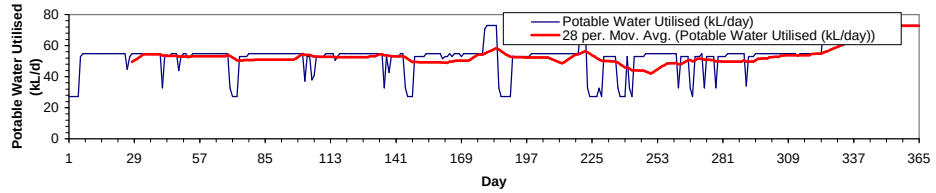


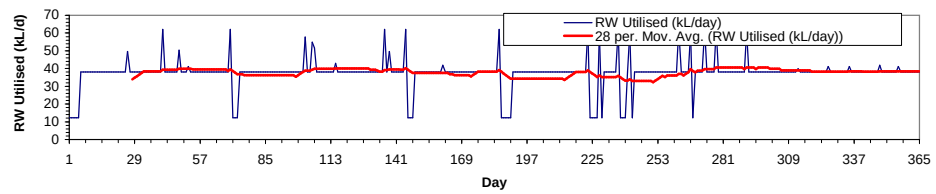




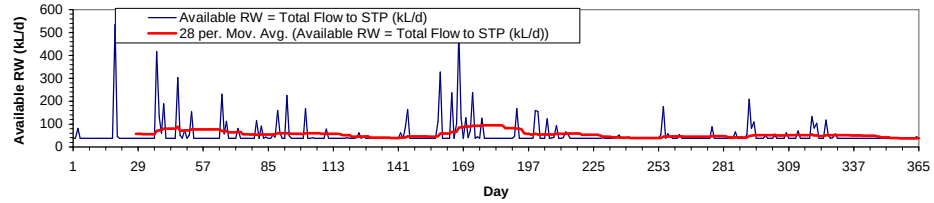


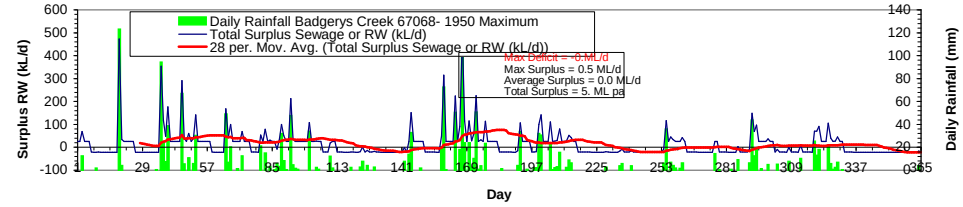


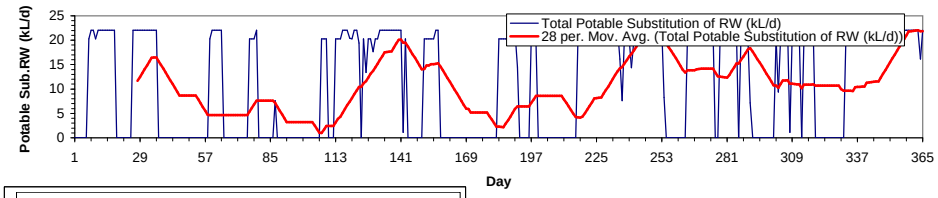


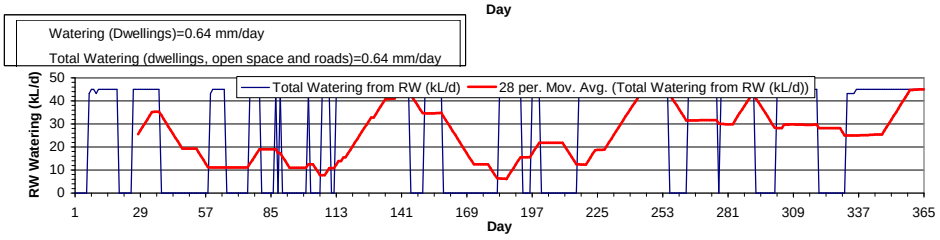


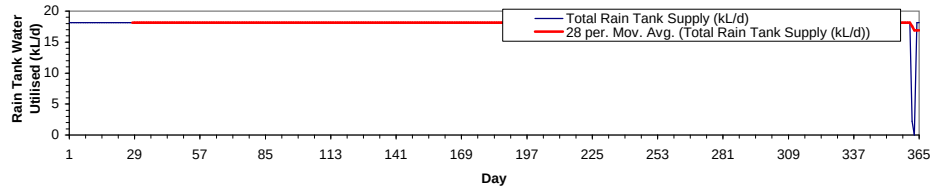
Scenario 4- Stage 1- Rainwater tanks for toilet and truck washing, 30kL tank - Wet Rainfall Year

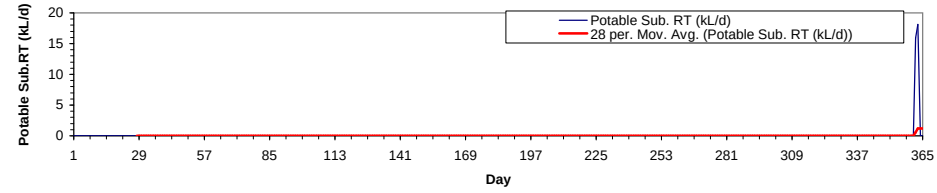


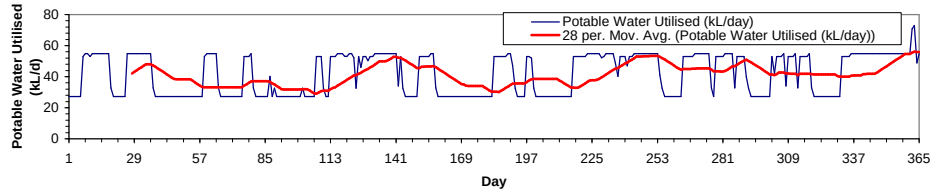


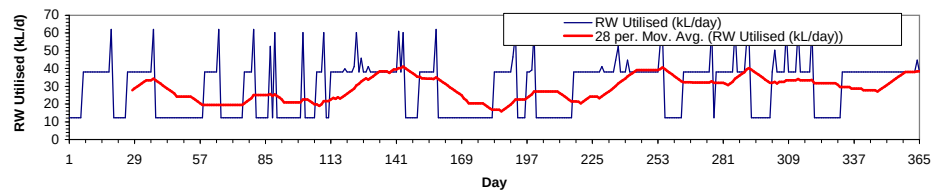




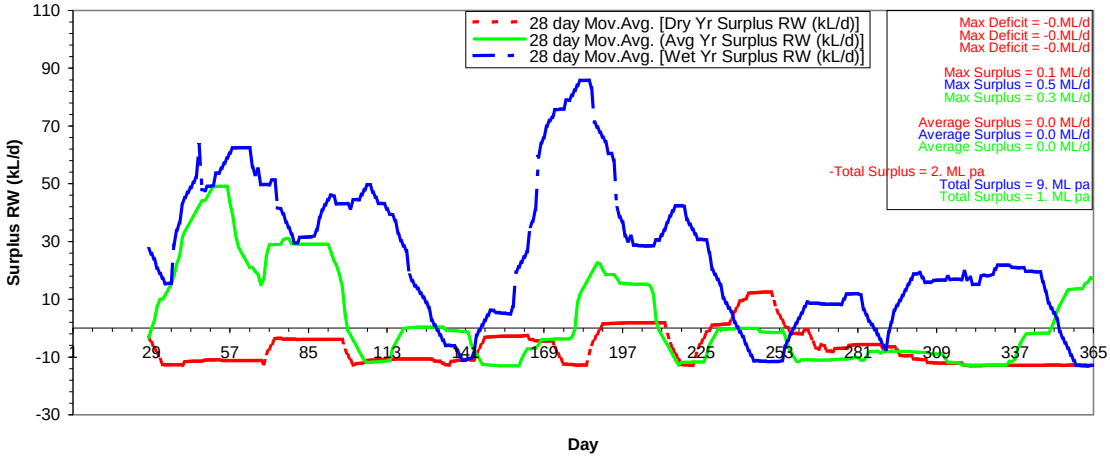


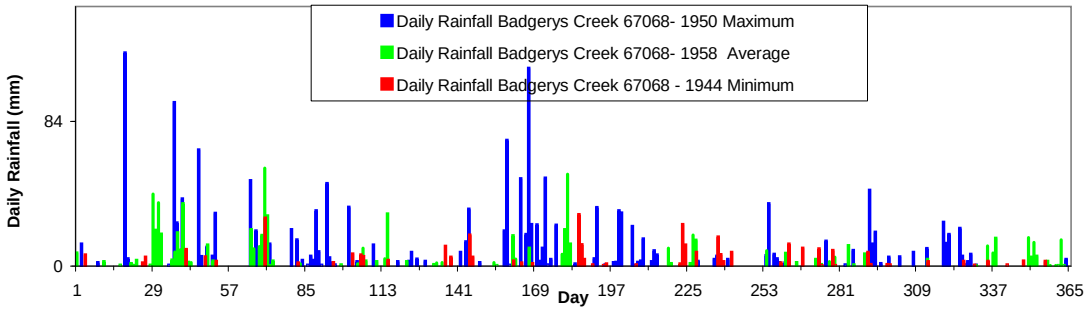




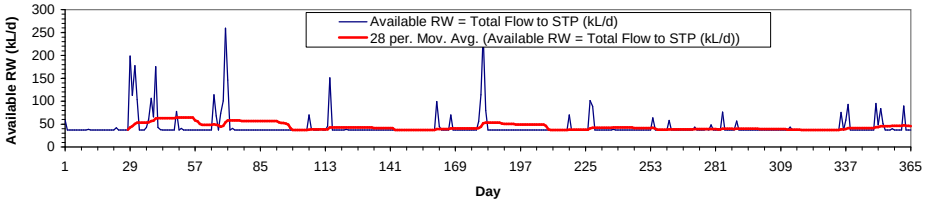


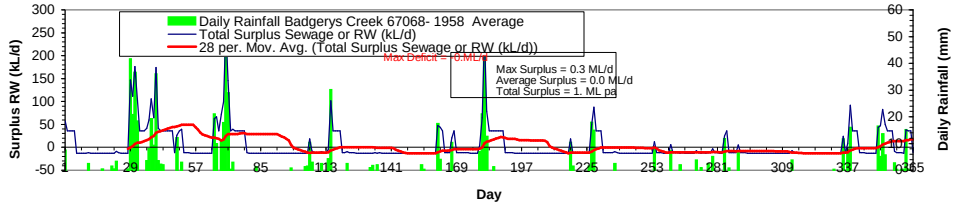
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 25 kL tank

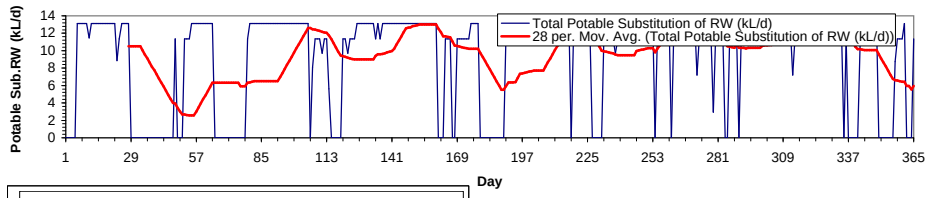


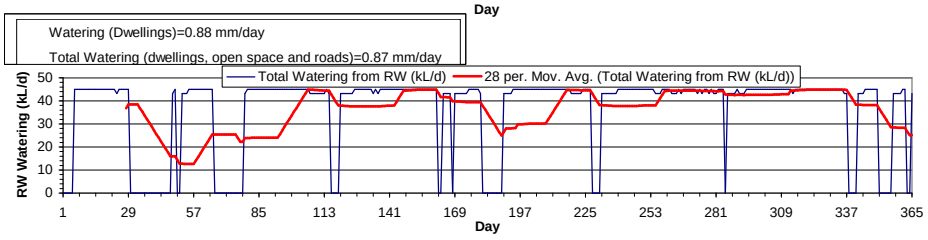


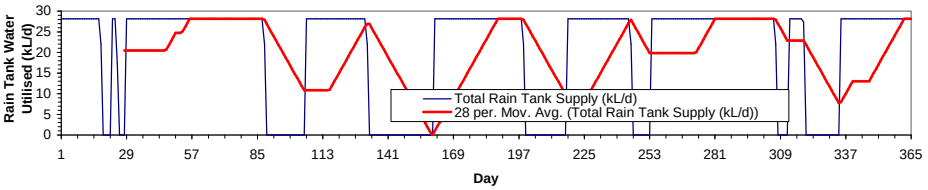
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 25 kL tank - Average Rainfall Year

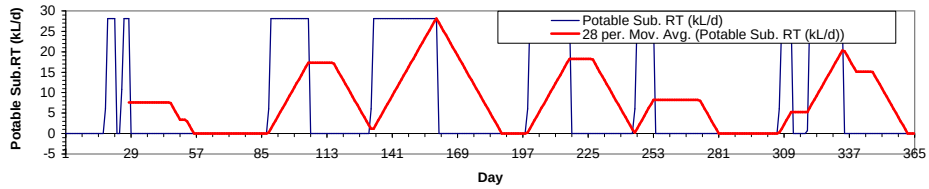


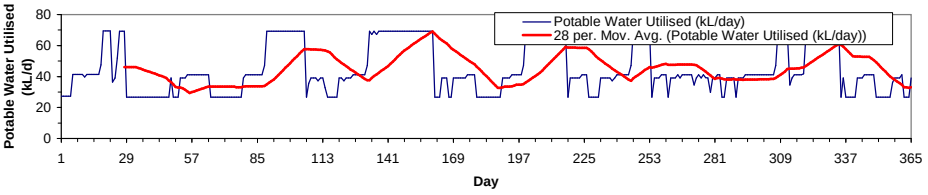


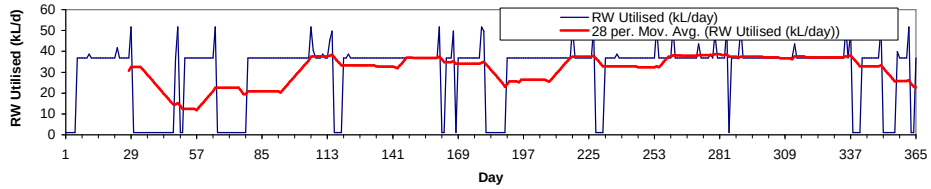




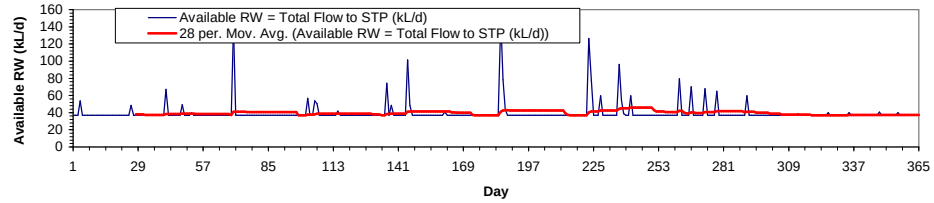


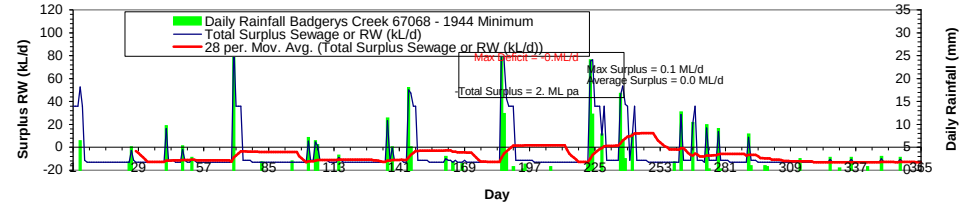


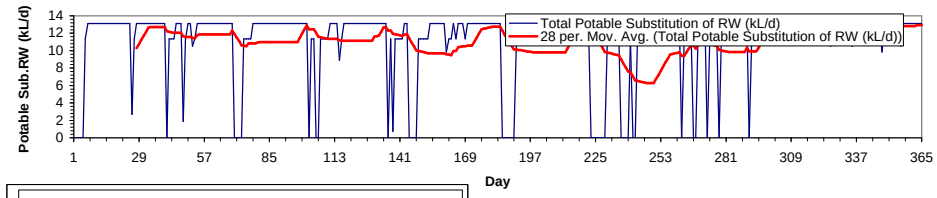


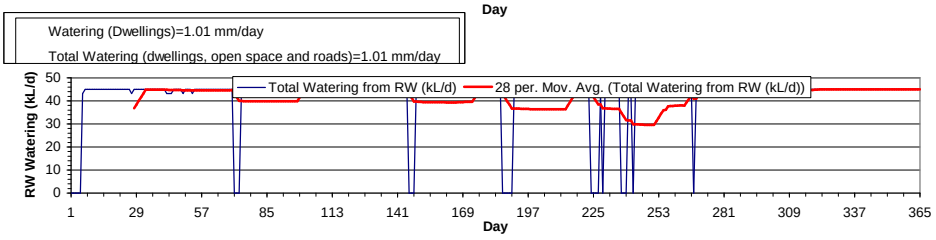


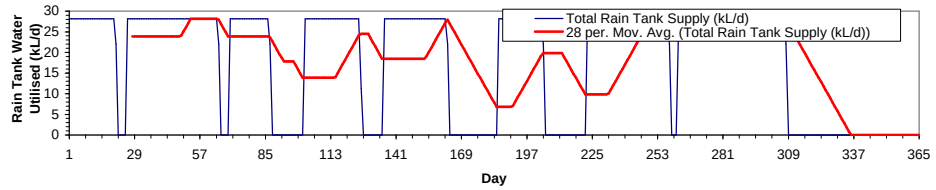
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 25 kL tank - Dry Rainfall Year

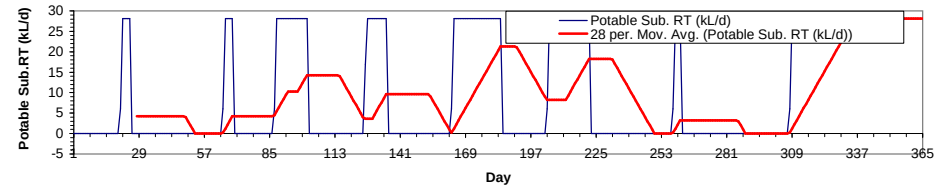


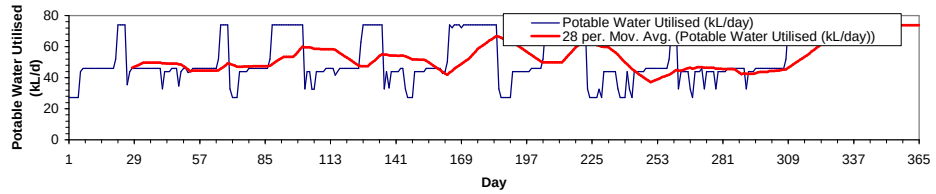


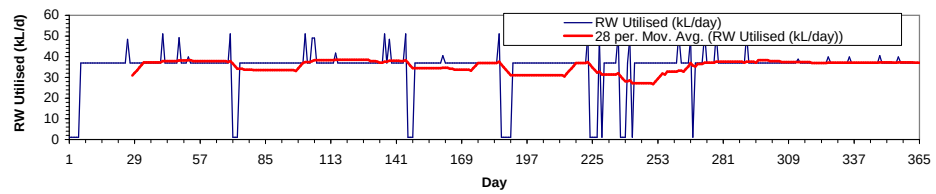




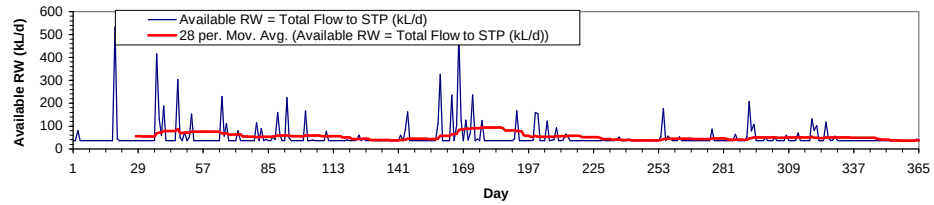


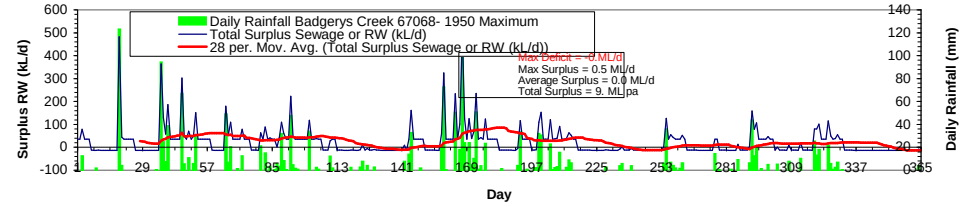


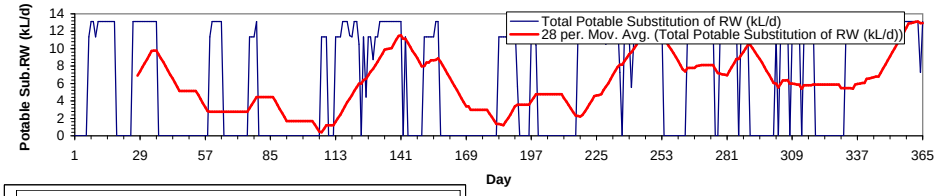


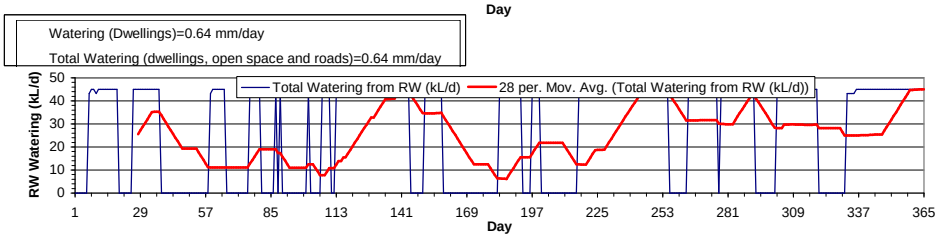


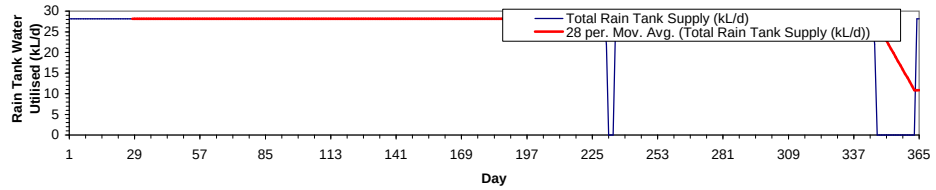
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 25 kL tank - Wet Rainfall Year

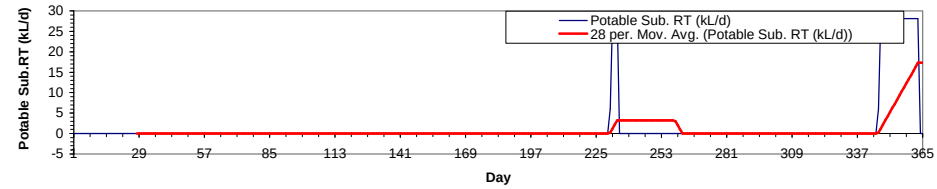


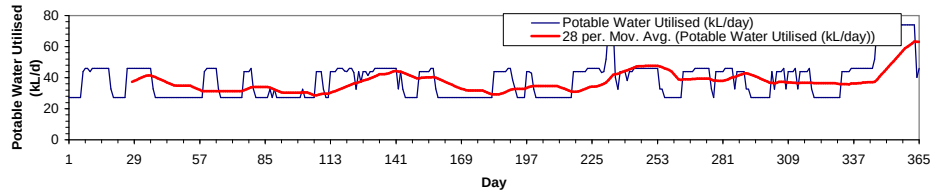


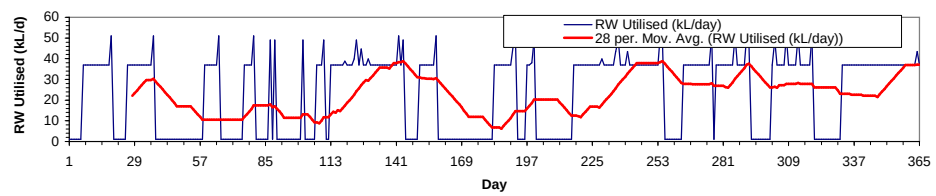




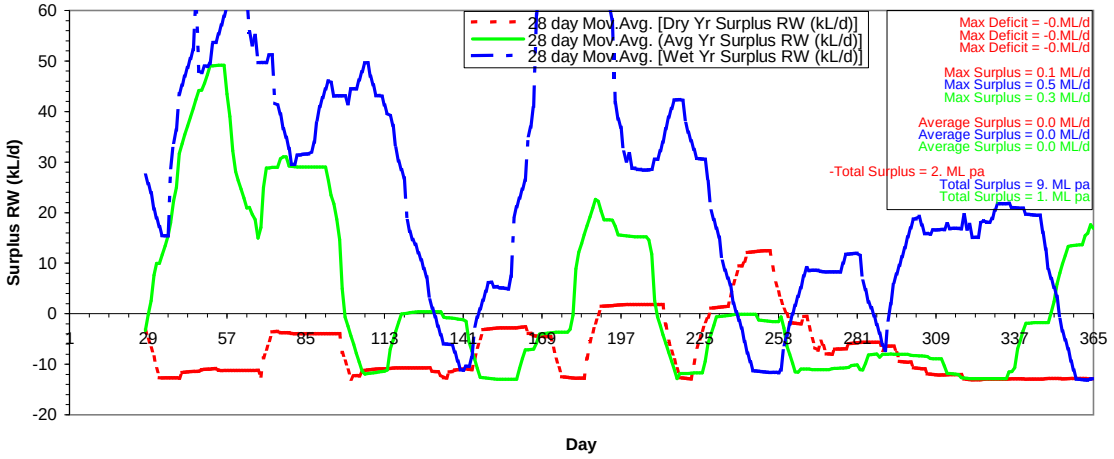


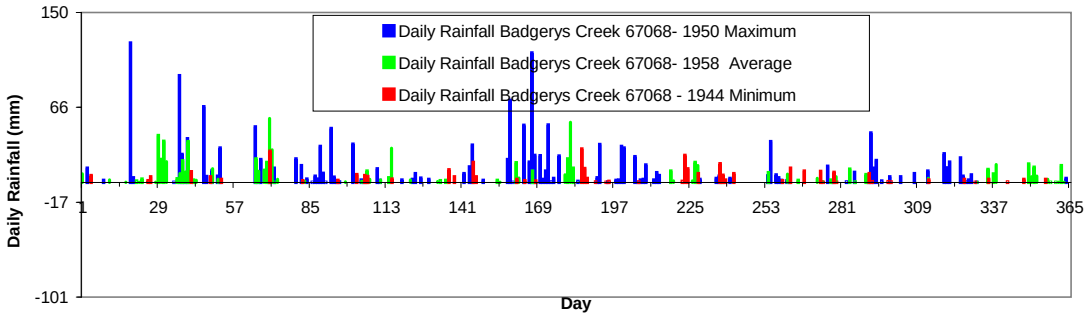




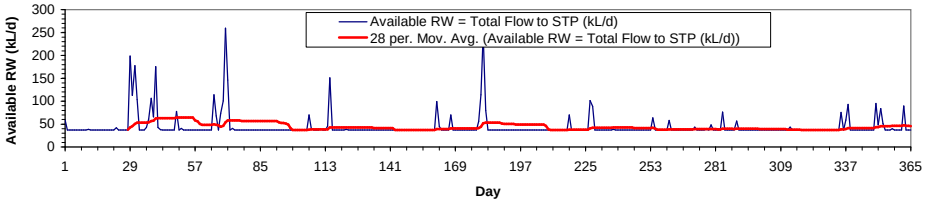


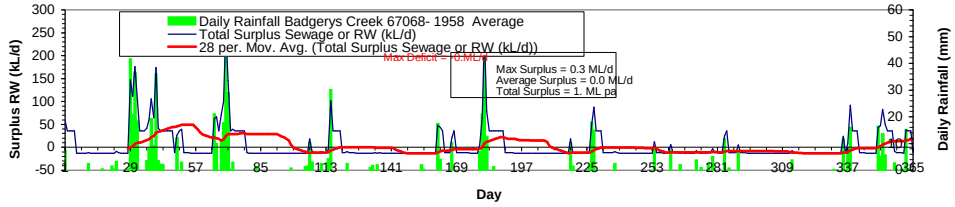
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 30 kL tank

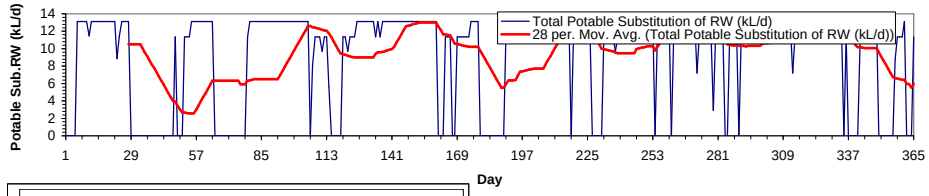


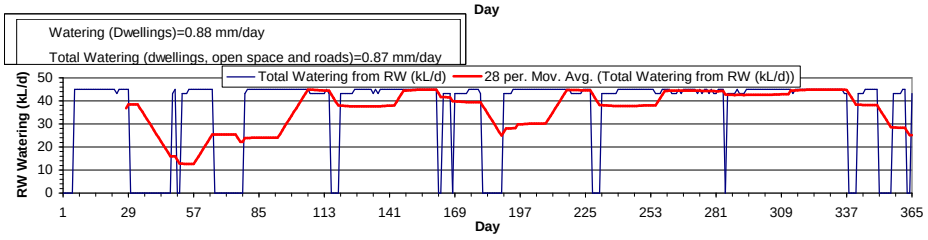


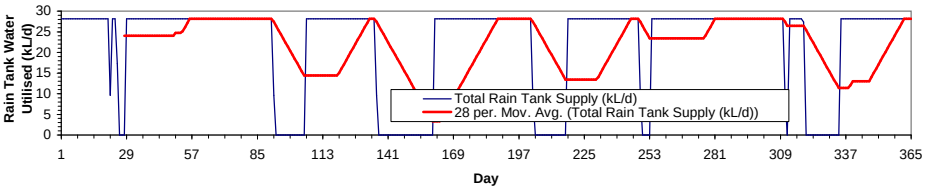
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 30 kL tank - Average Rainfall Year

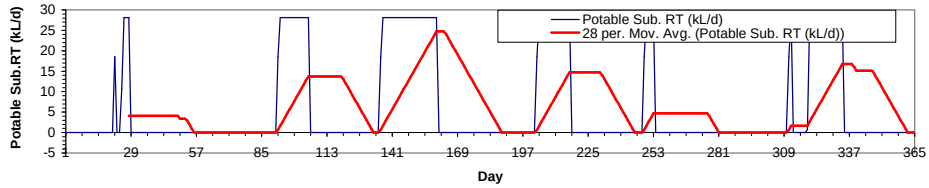


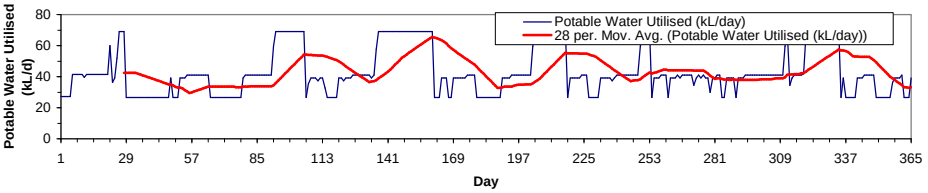


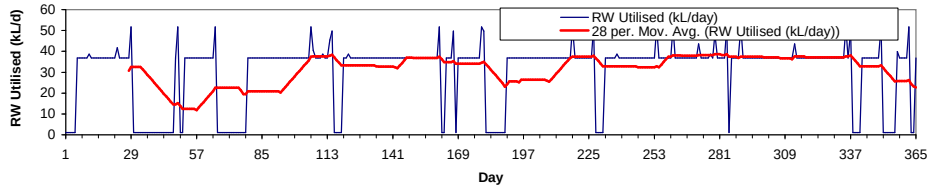




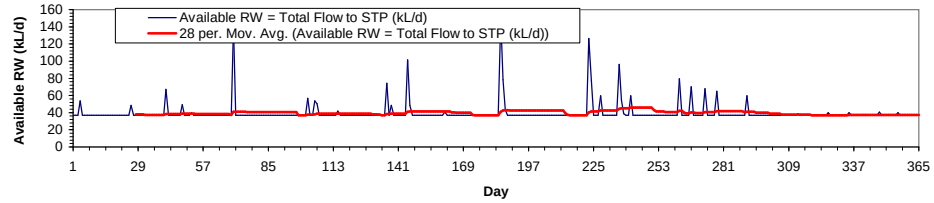


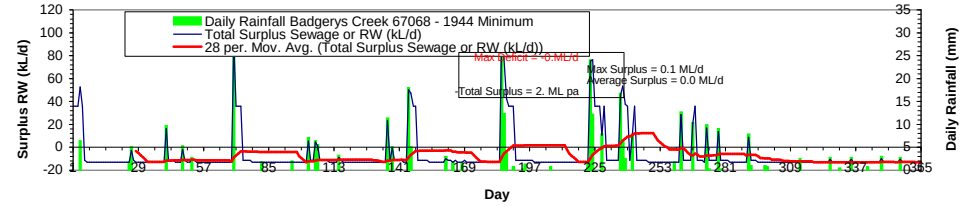


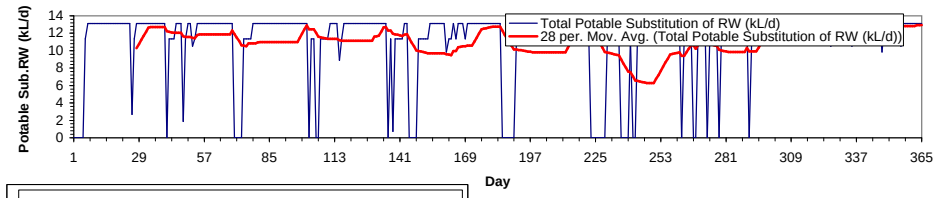


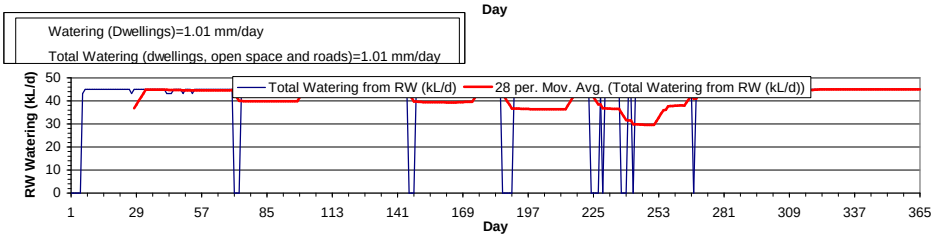


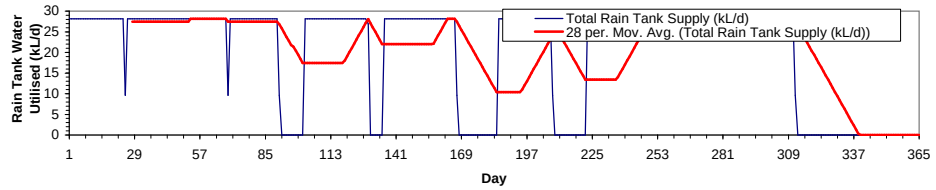
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 30 kL tank - Dry Rainfall Year

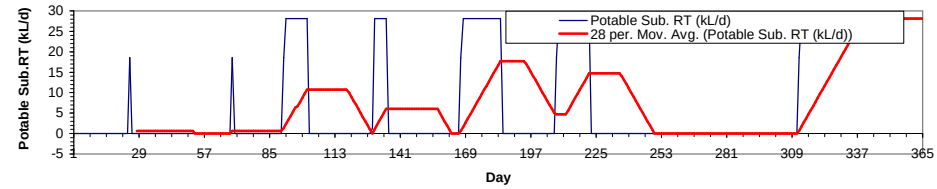


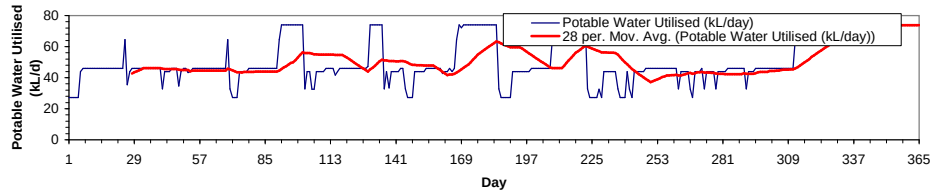


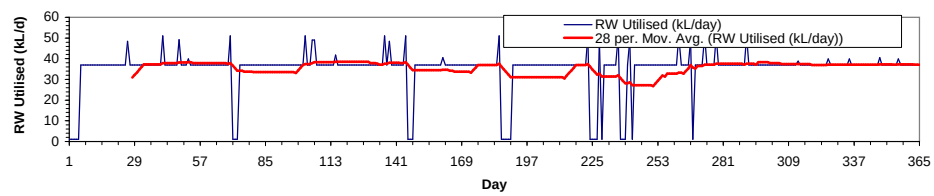




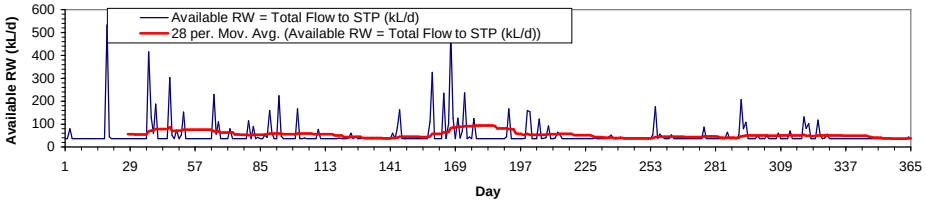


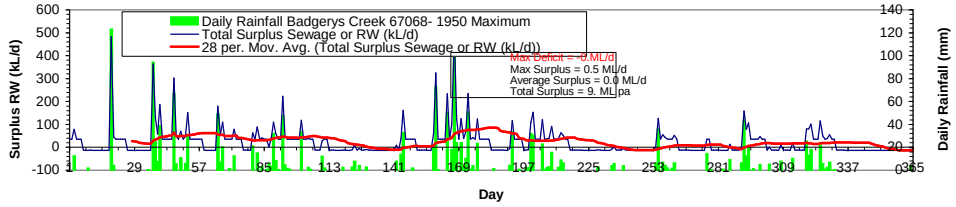


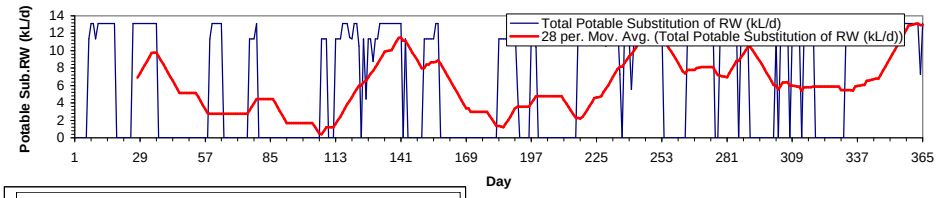


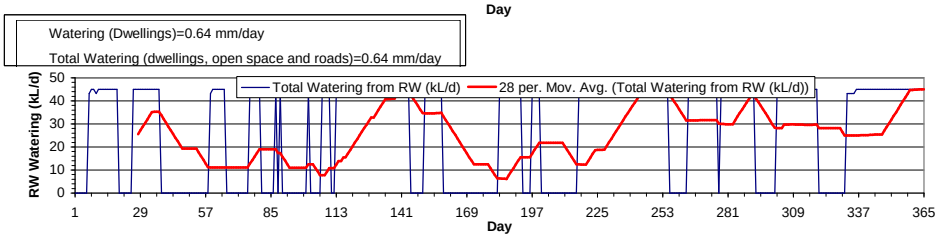


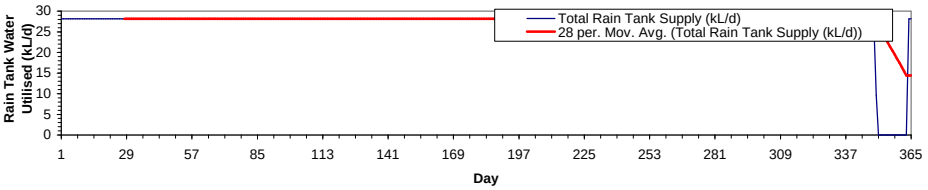
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 30 kL tank - Wet Rainfall Year

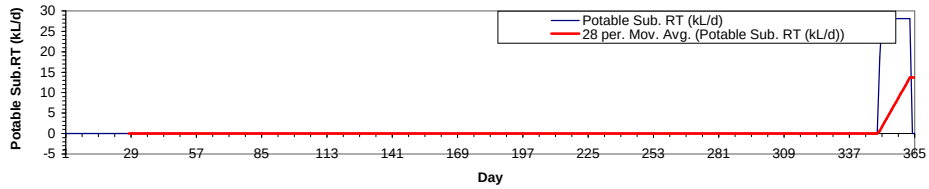


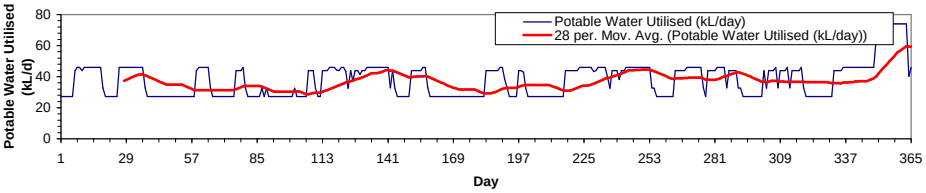


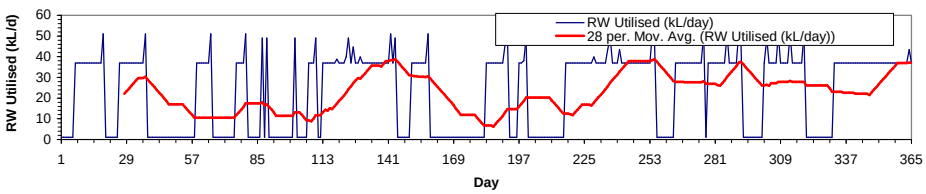




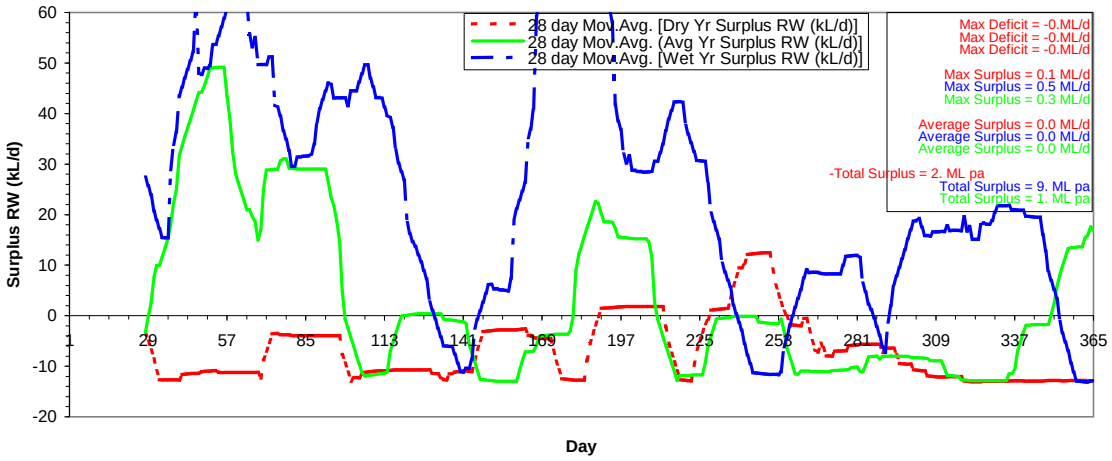


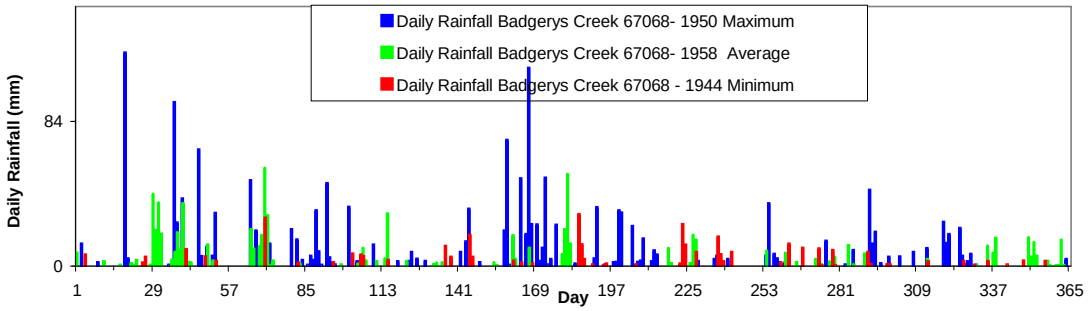




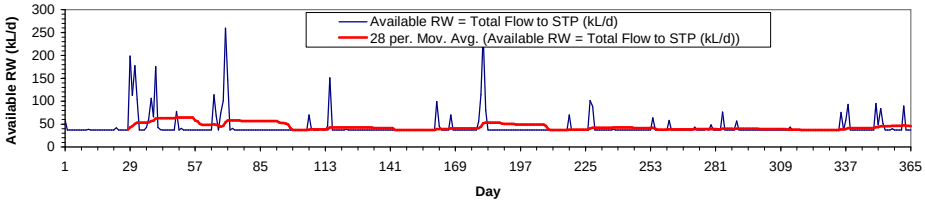


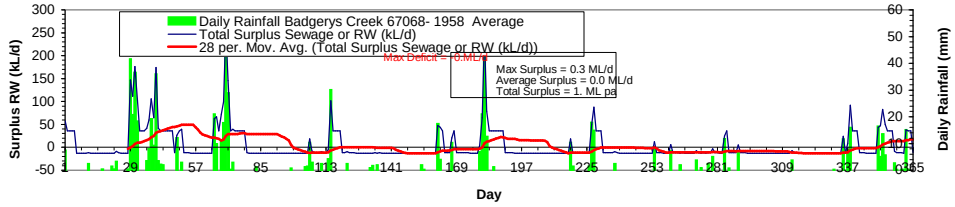
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 35 kL tank

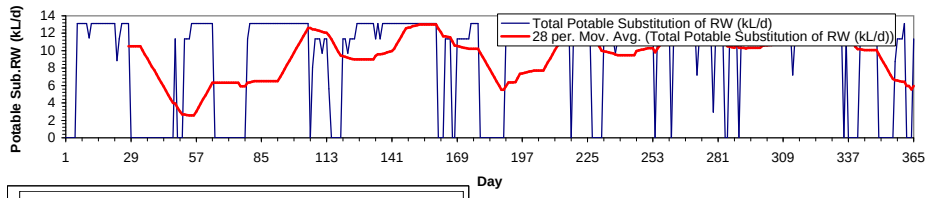


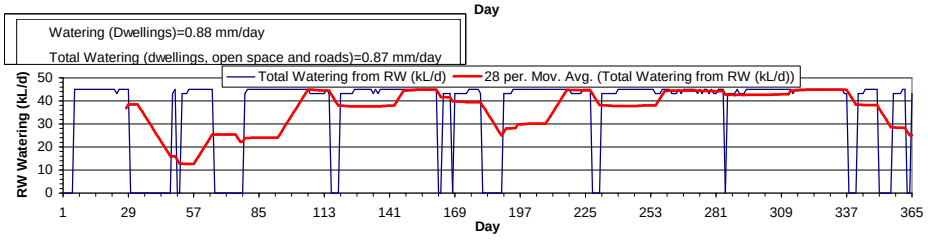


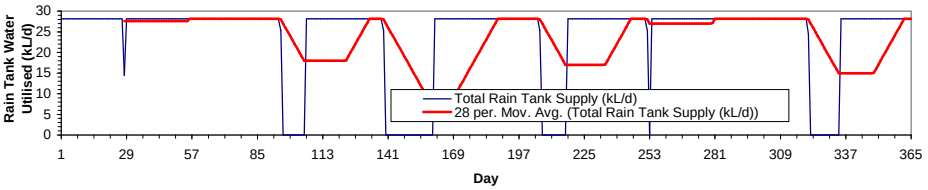
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 35 kL tank - Average Rainfall Year

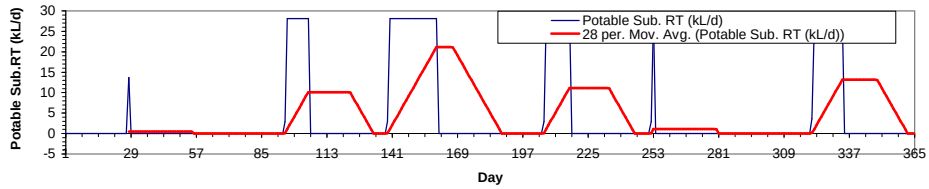


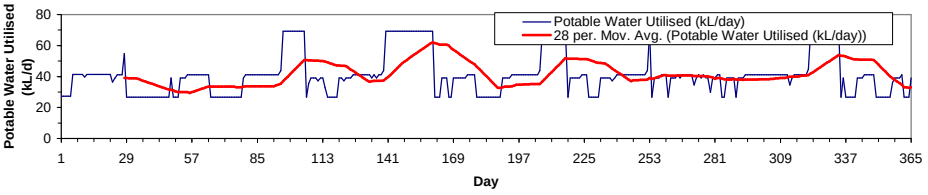


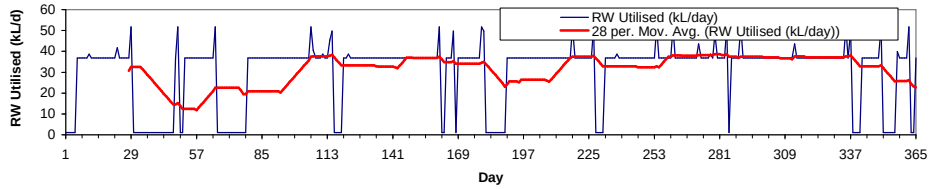




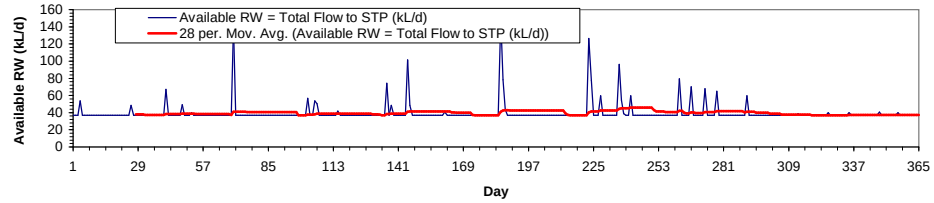


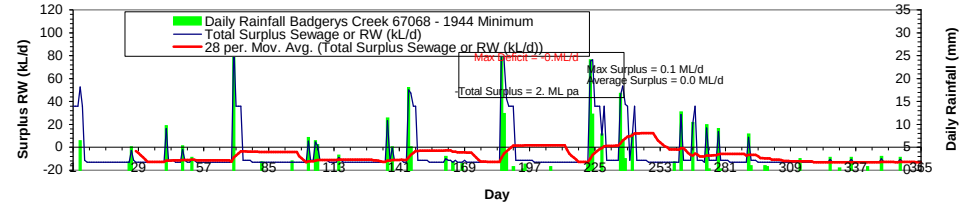


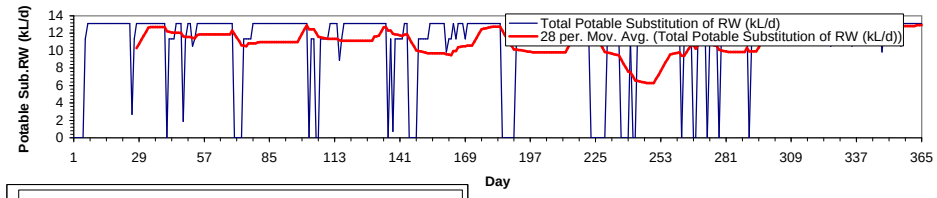


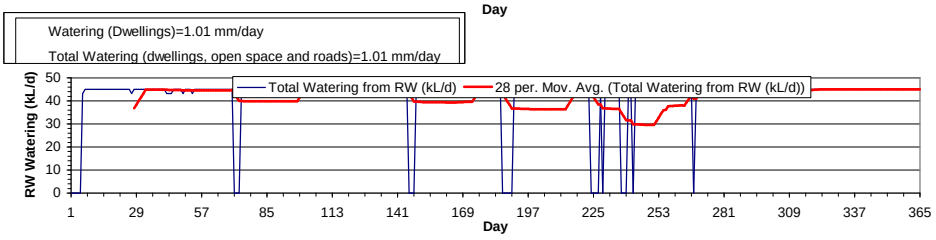


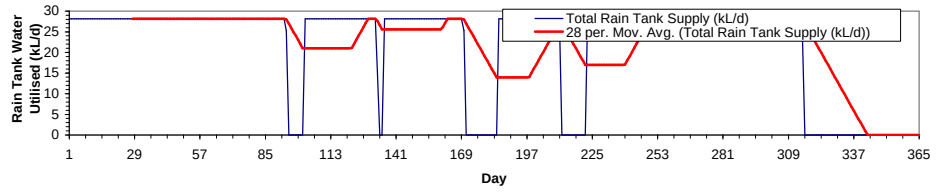
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 35 kL tank - Dry Rainfall Year

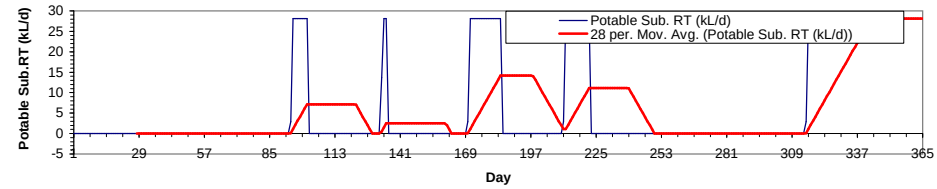


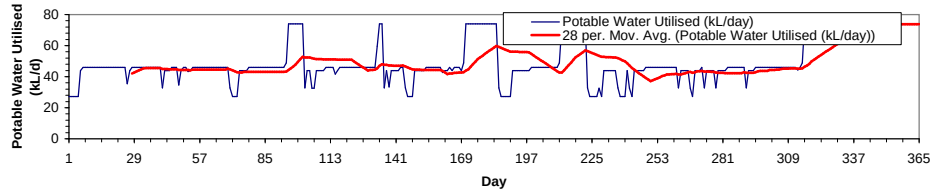


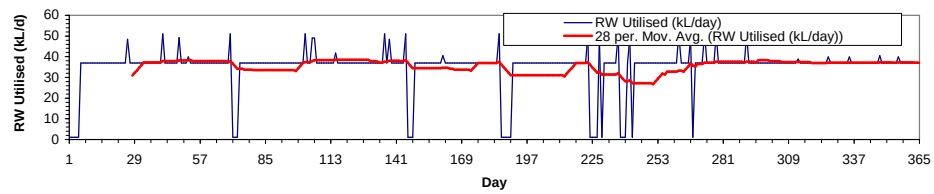




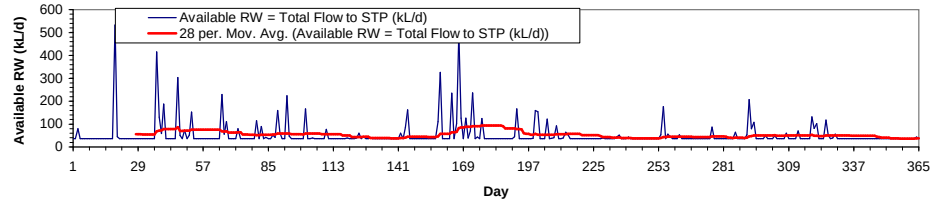


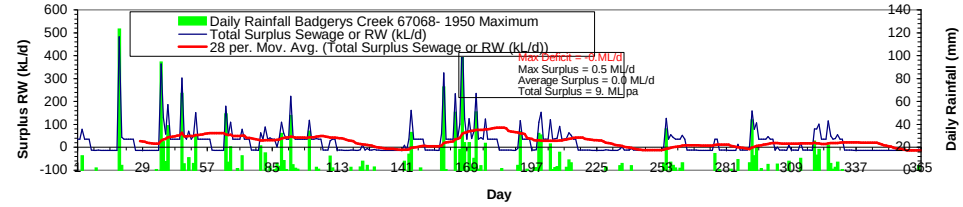


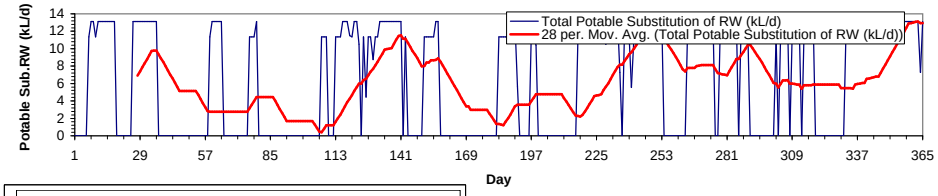


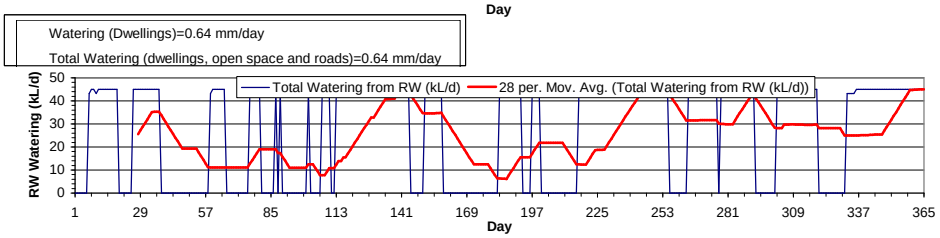


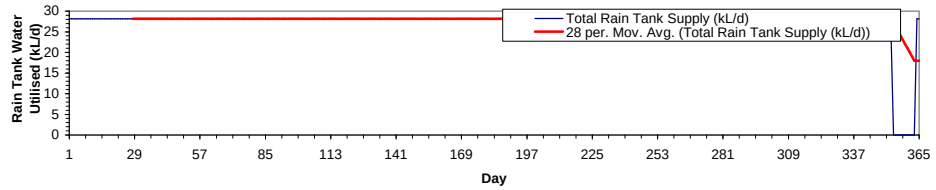
Scenario 4- Stage 1 - Rainwater Tanks for Toilets, truck wash and air conditioning, 35 kL tank - Wet Rainfall Year

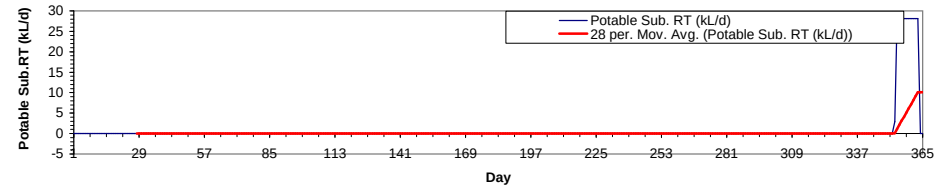


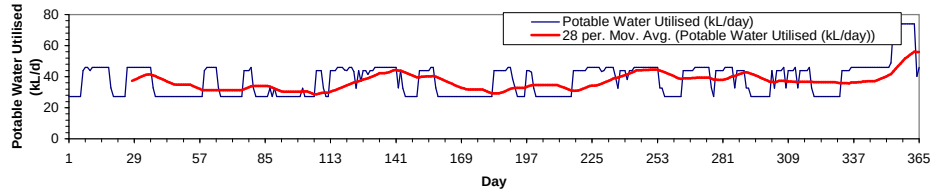


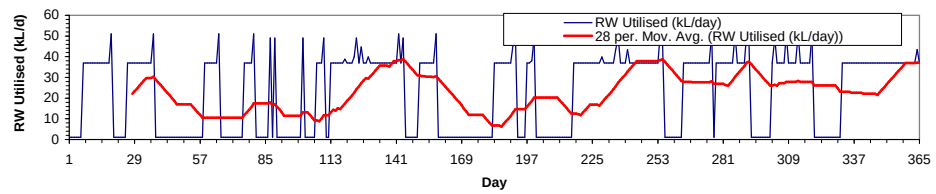




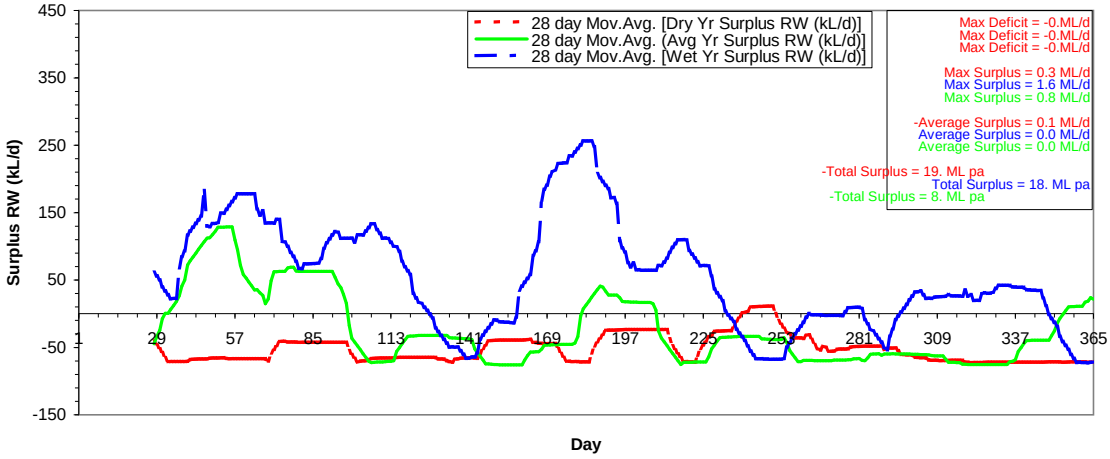


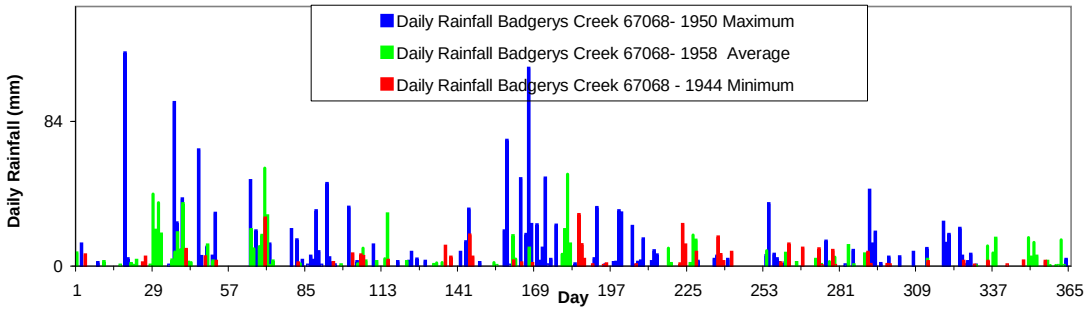




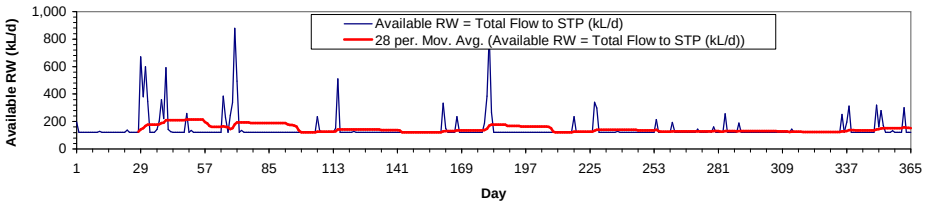


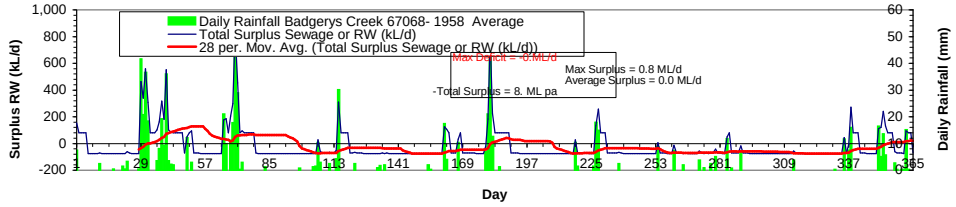
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 25kL tank

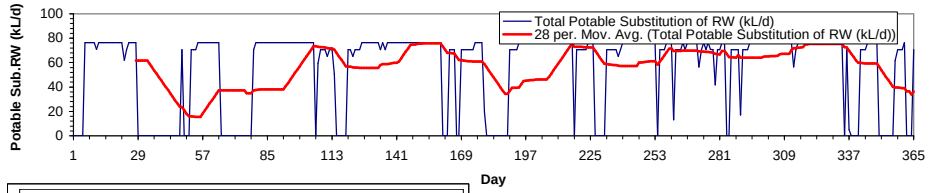


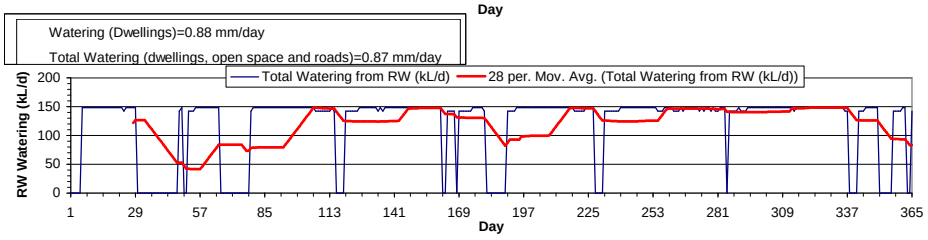


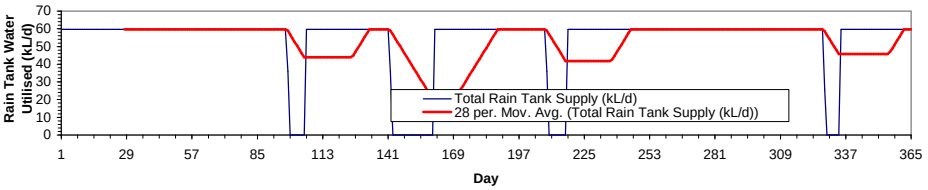
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 25kL tank - Average Rainfall Year

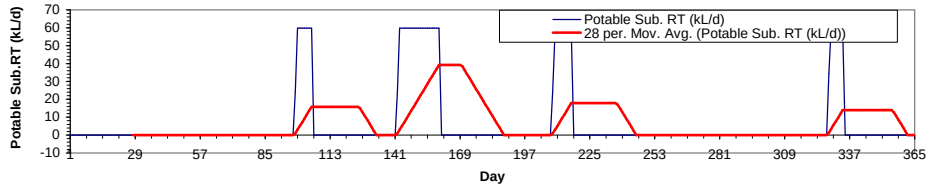


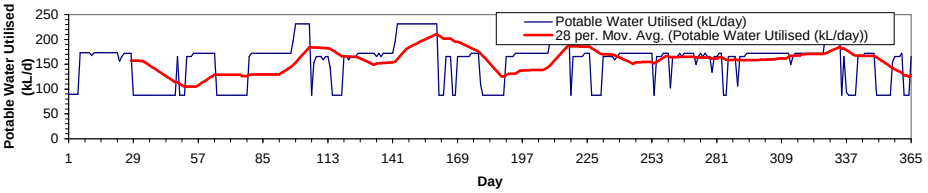


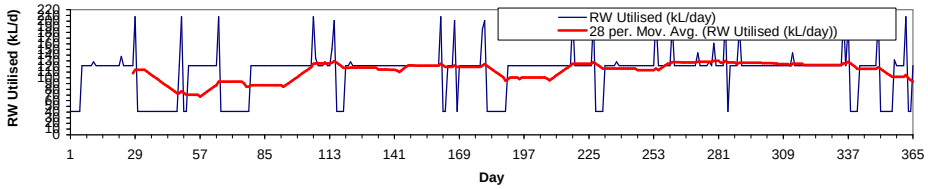




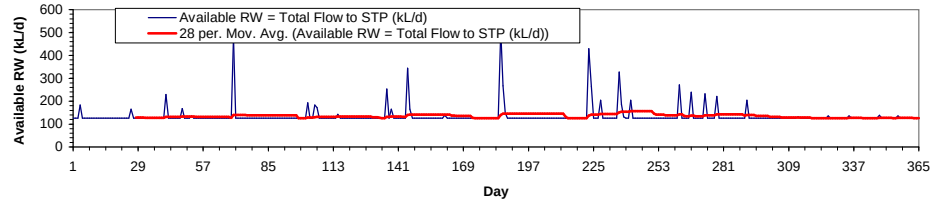


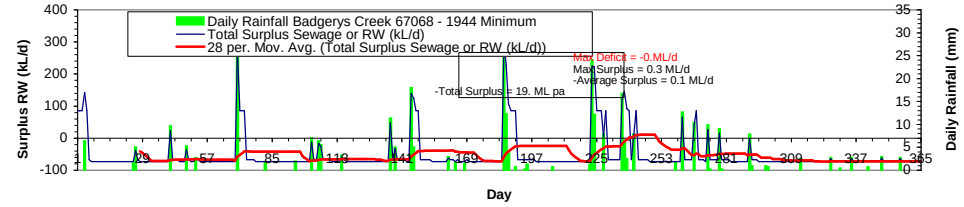


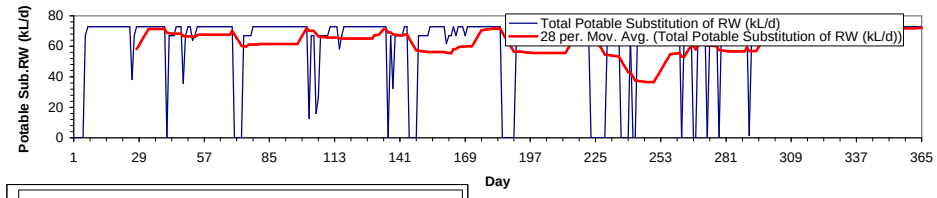


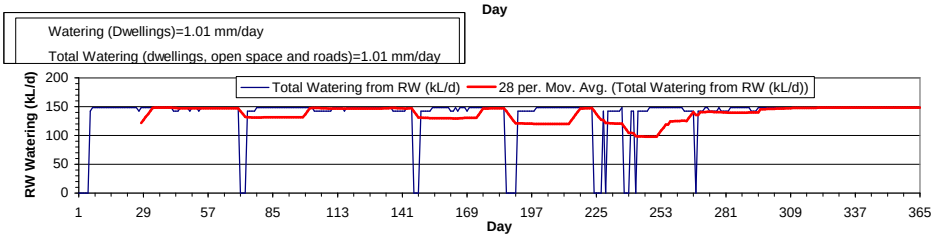


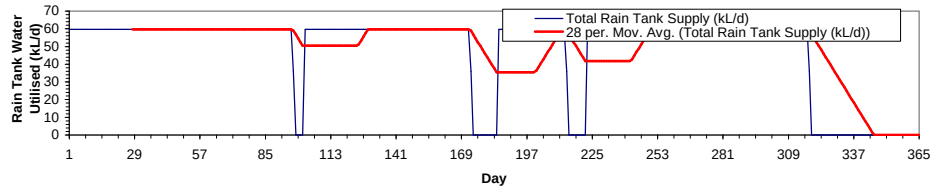
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 25kL tank - Dry Rainfall Year

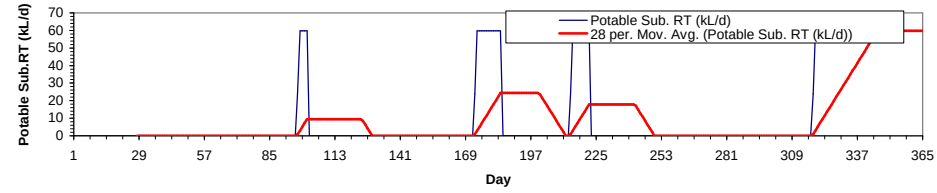


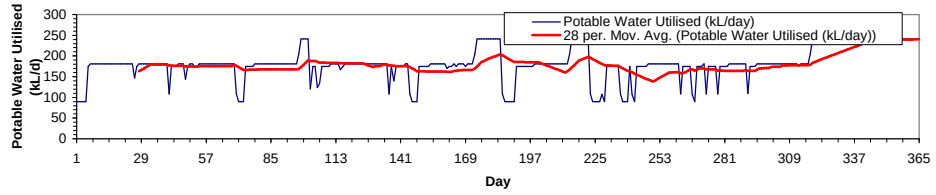


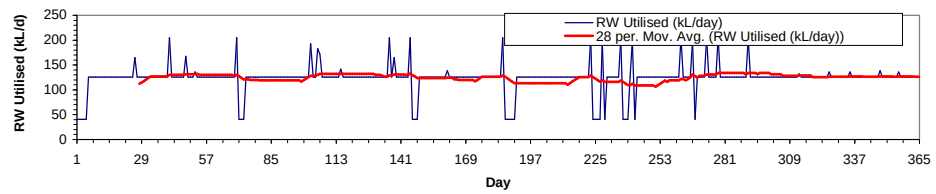




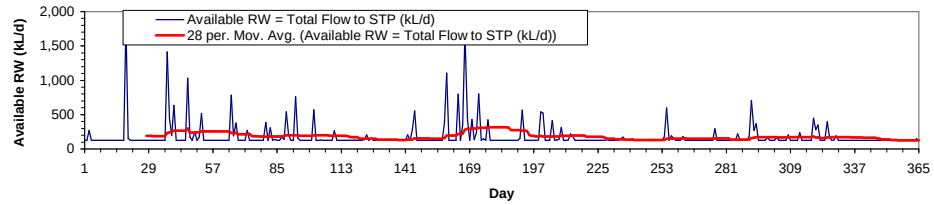


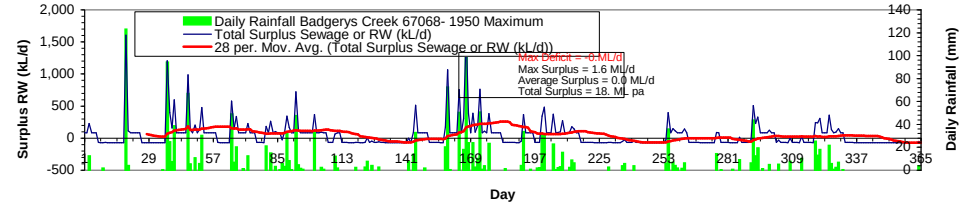


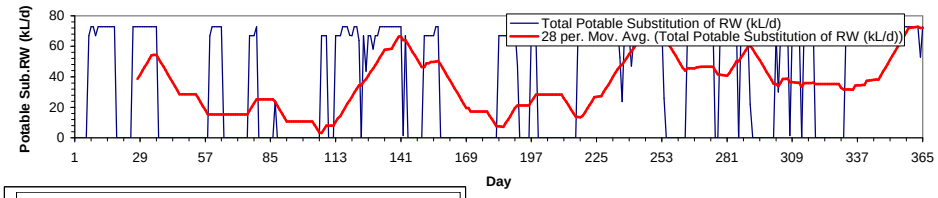


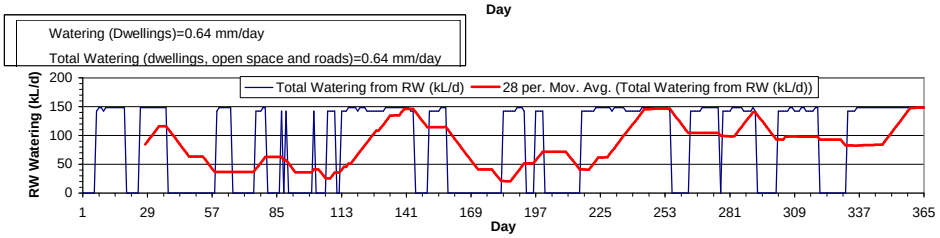


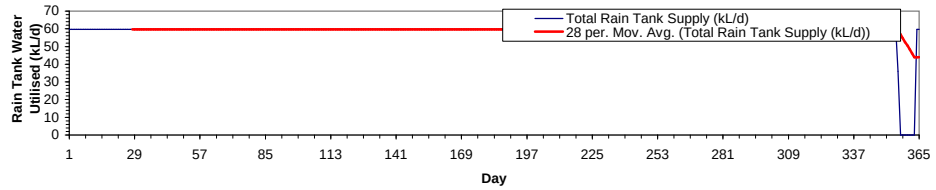
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 25kL tank - Wet Rainfall Year

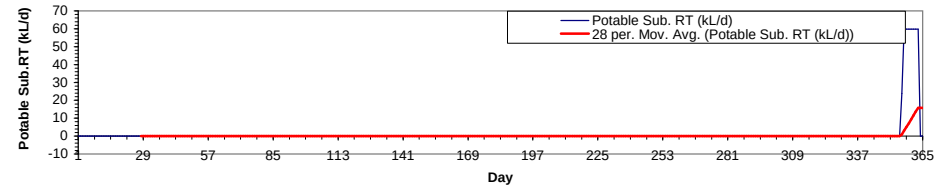


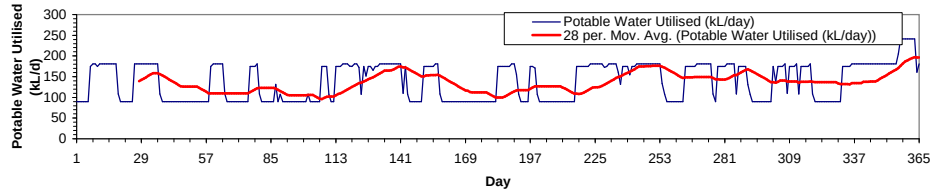


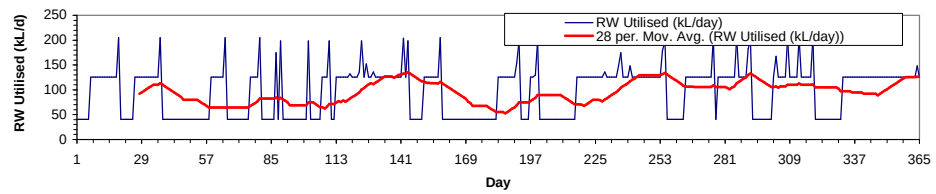




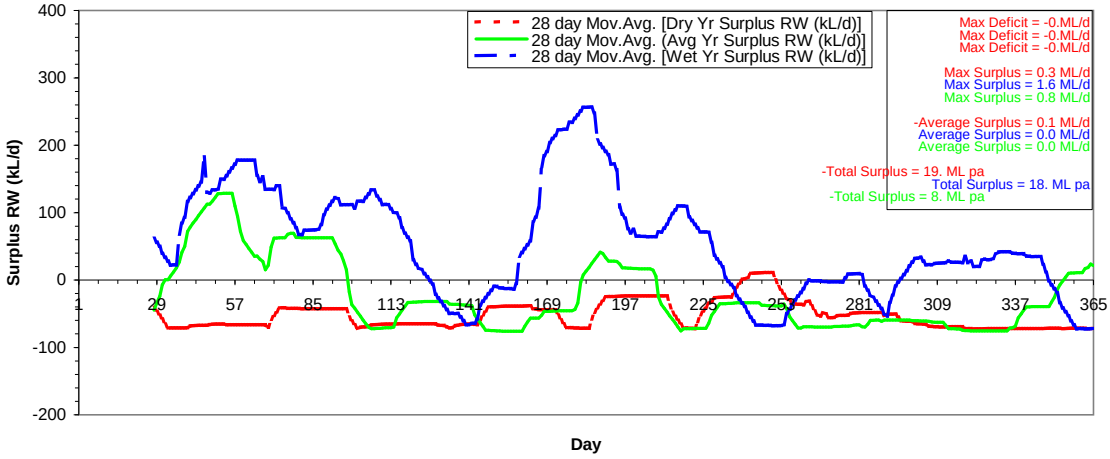


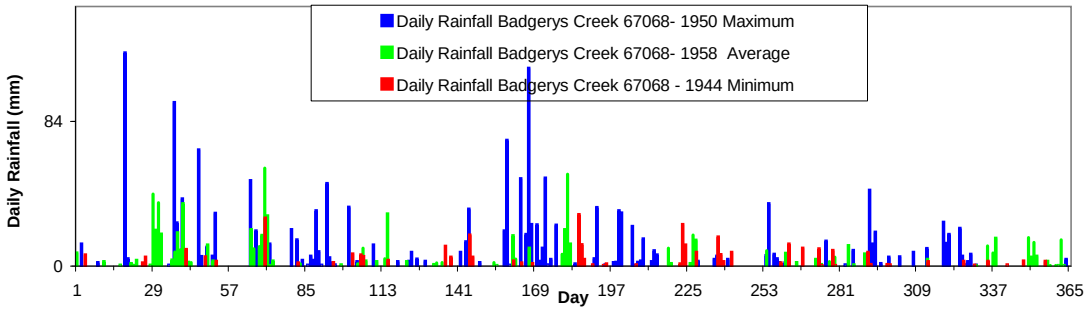




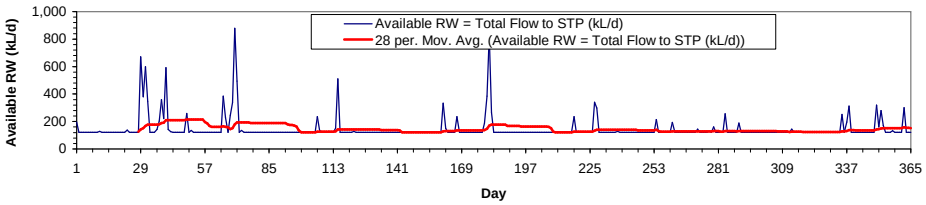


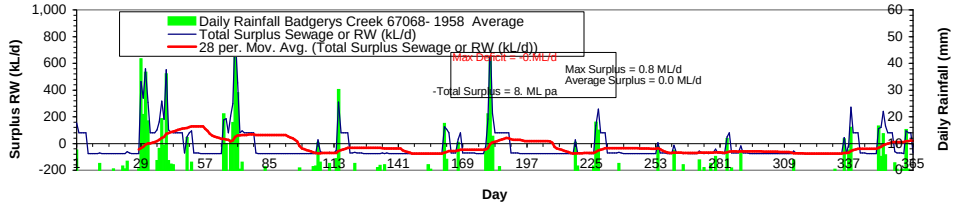
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 30kL tank

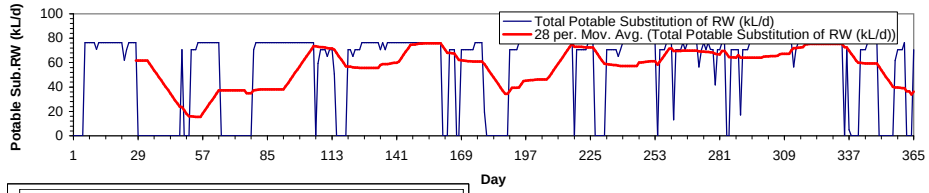


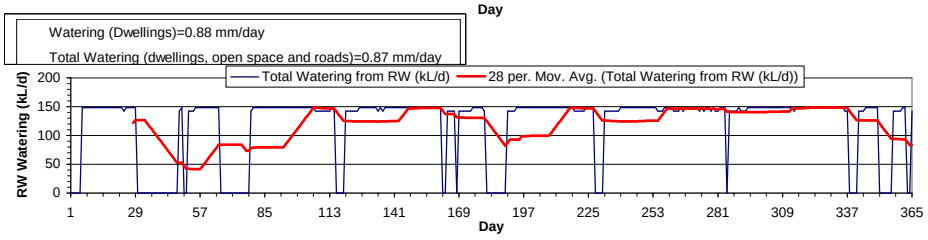


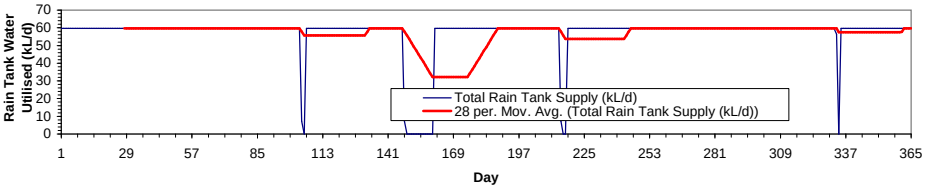
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 30kL tank - Average Rainfall Year

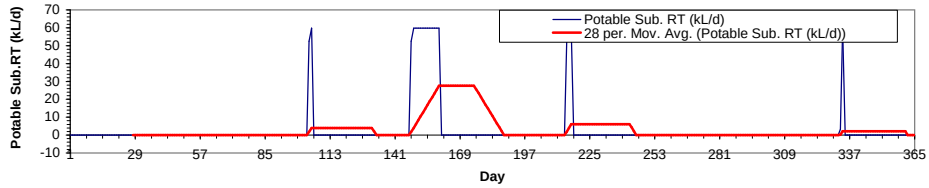


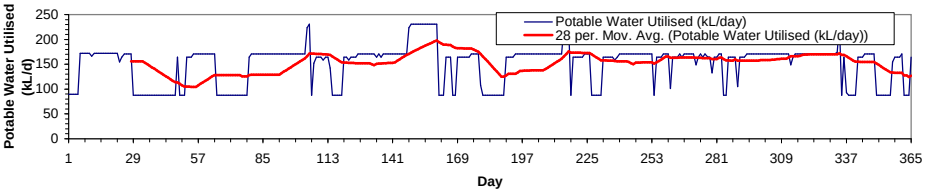


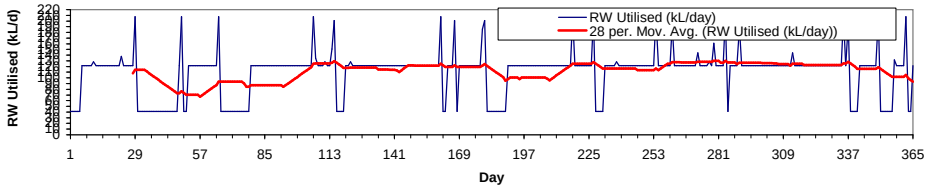




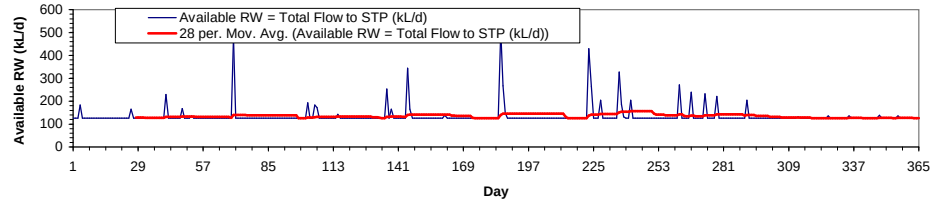


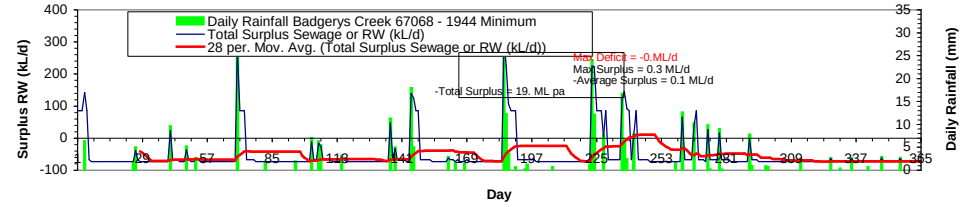


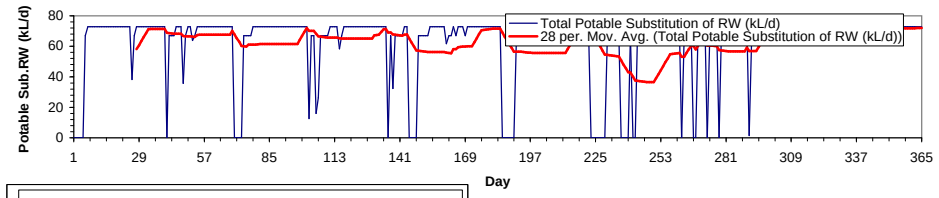


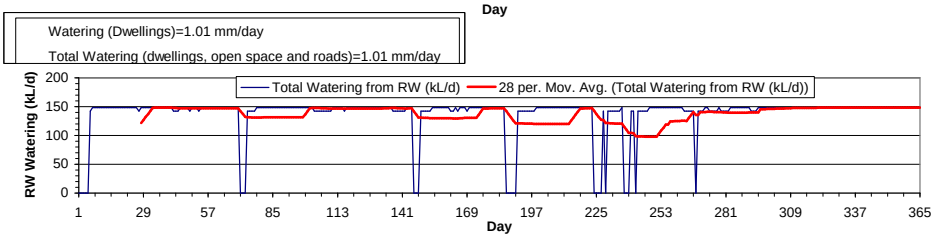


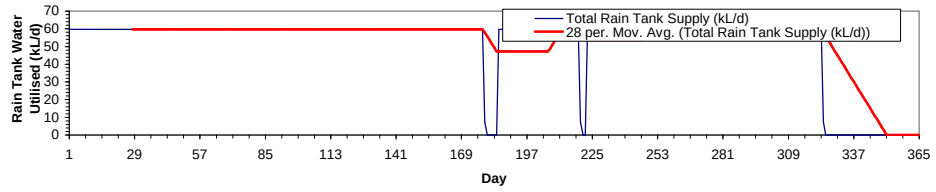
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 30kL tank - Dry Rainfall Year

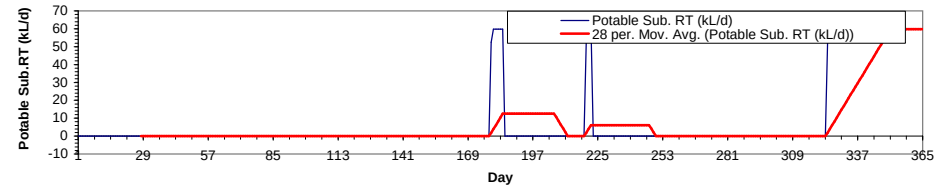


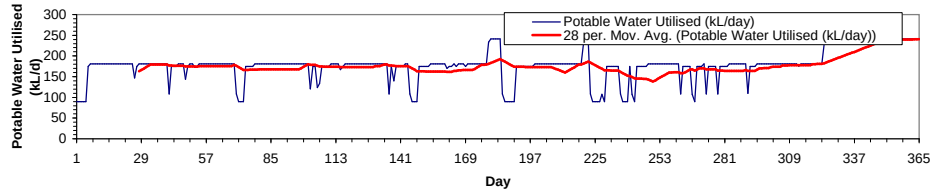


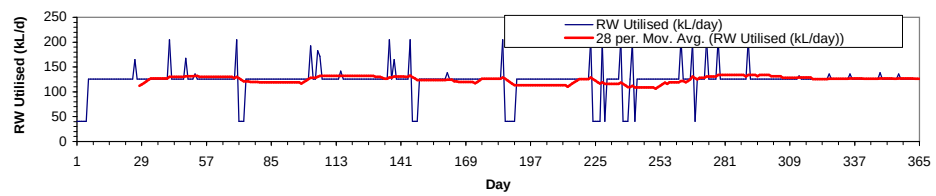




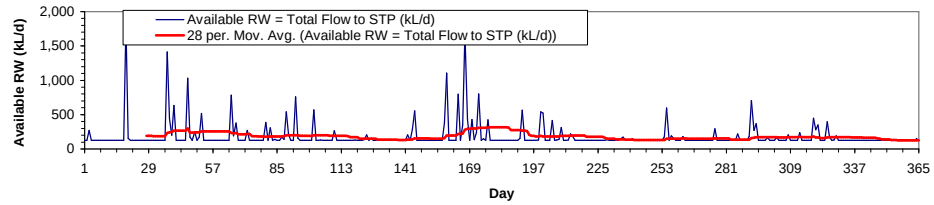


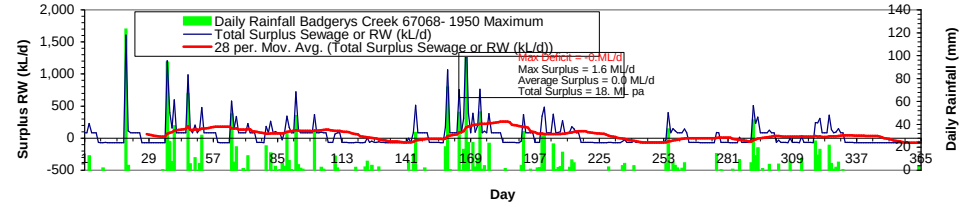


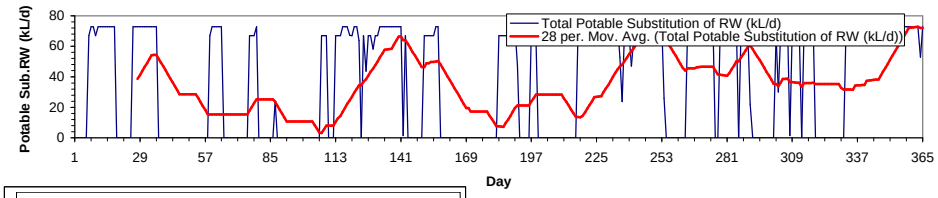


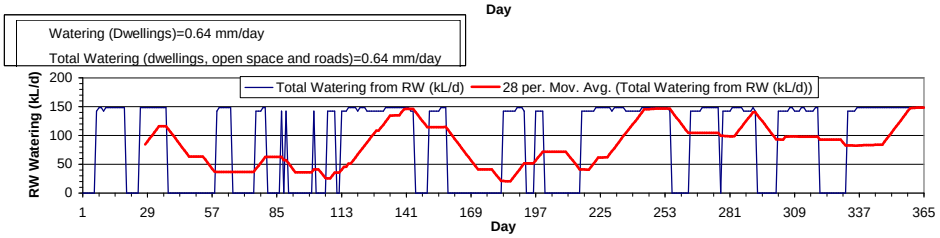


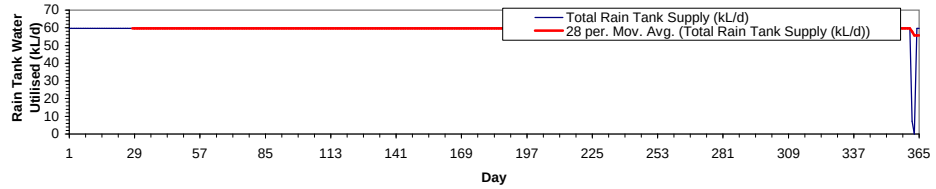
Scenario 4- Stage 2- Rainwater tank to supply toilet and truck wash, 30kL tank - Wet Rainfall Year

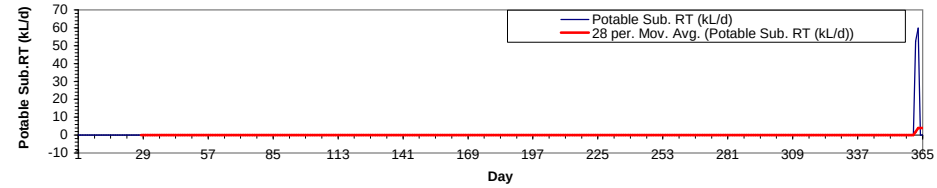


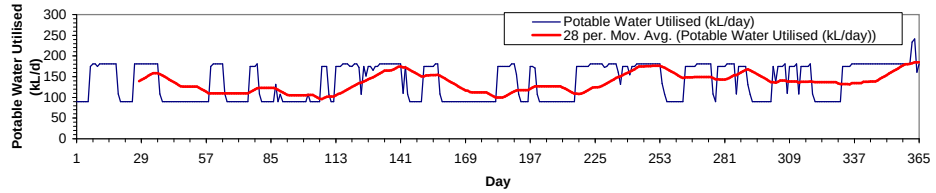


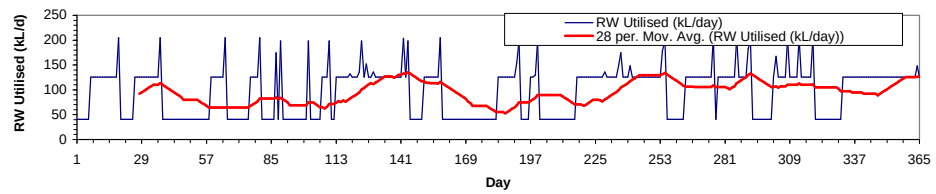




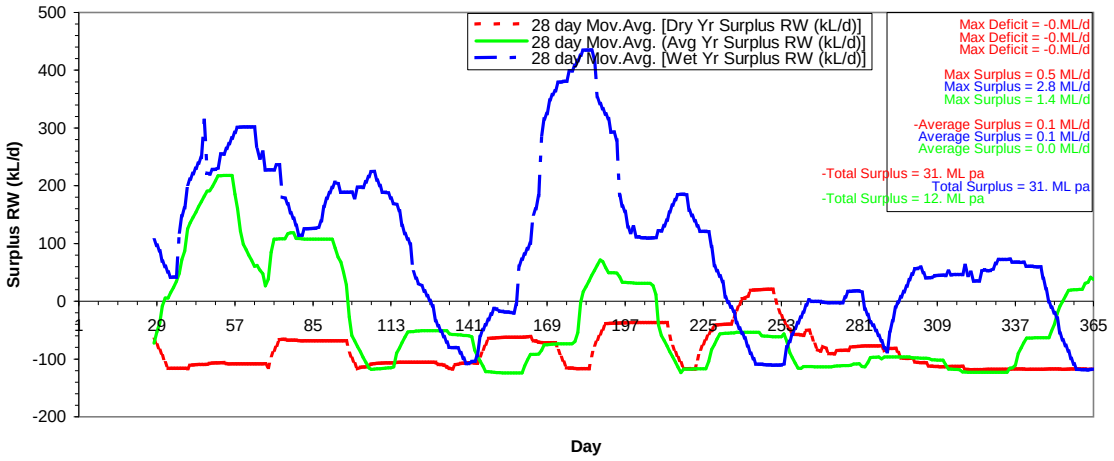


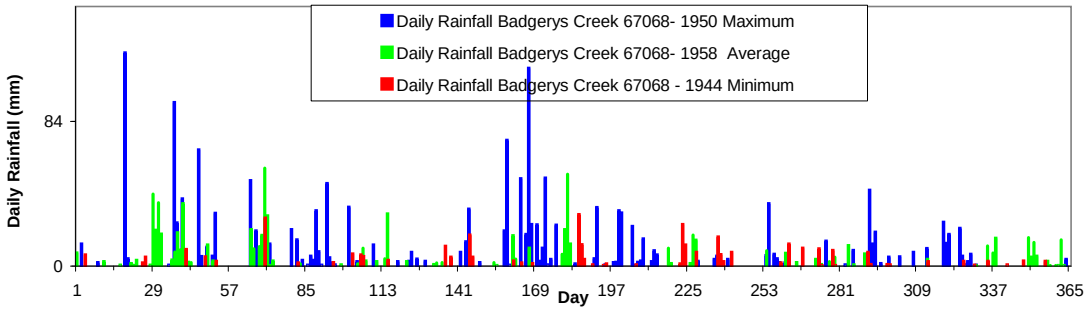




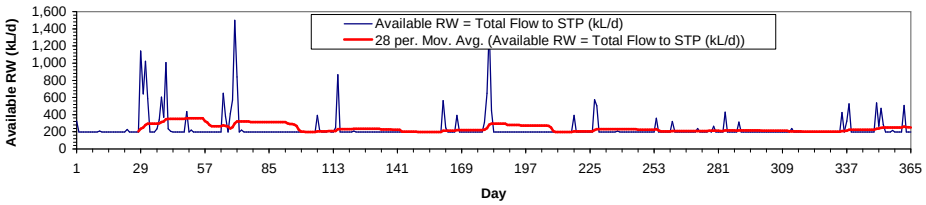


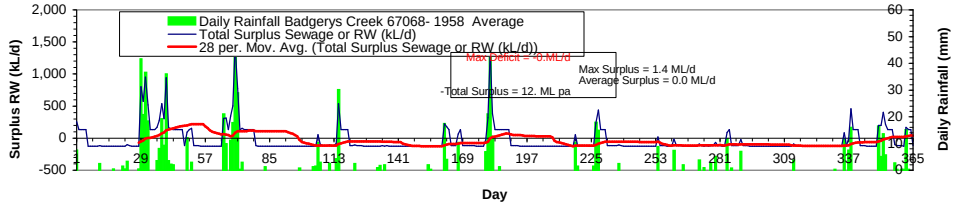
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 25kL tank

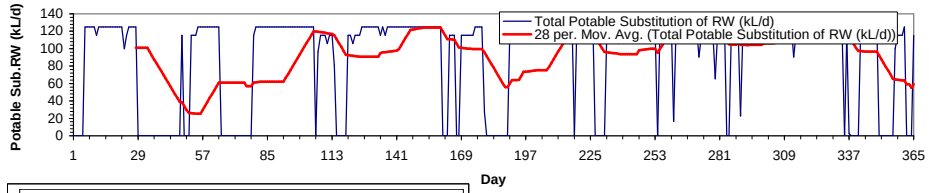


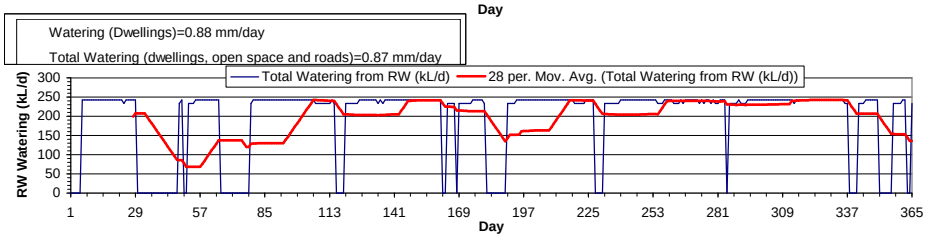


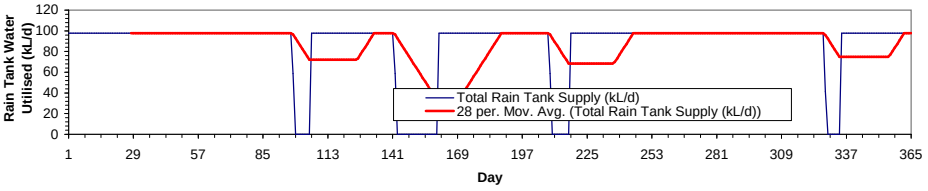
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 25kL tank - Average Rainfall Year

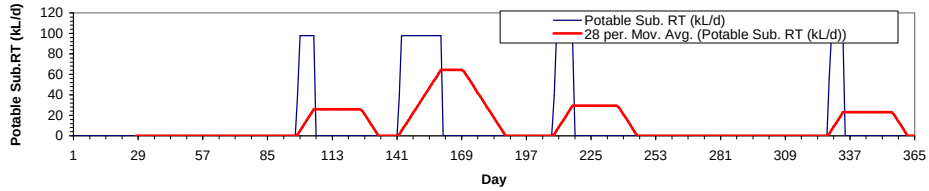


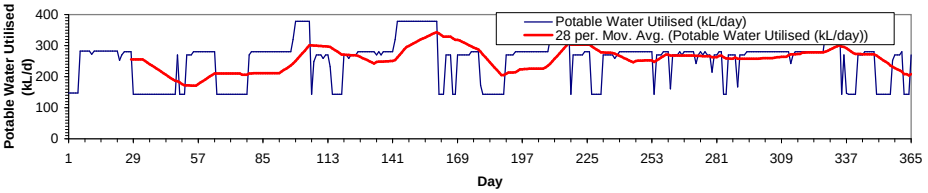


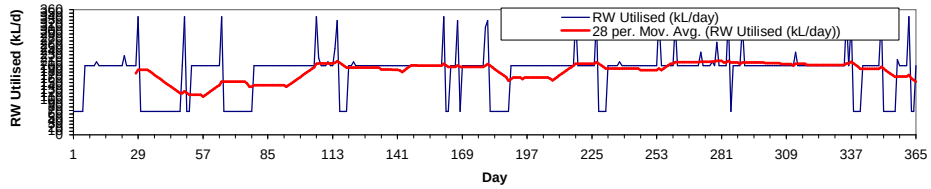




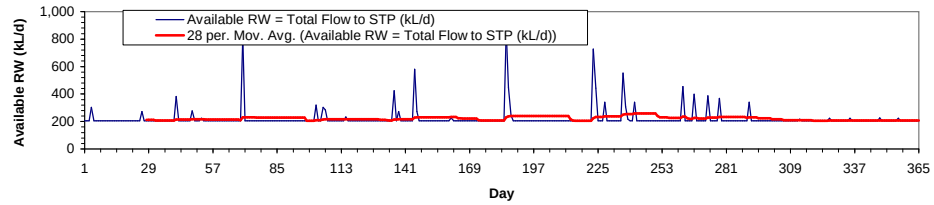


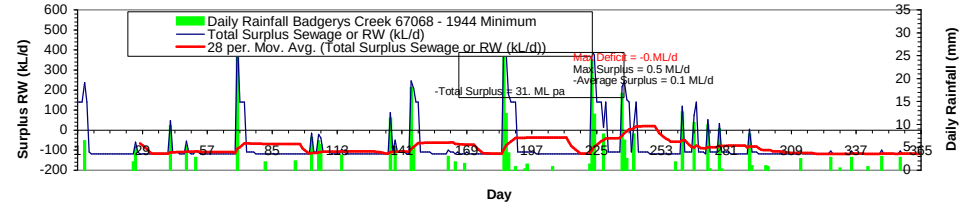


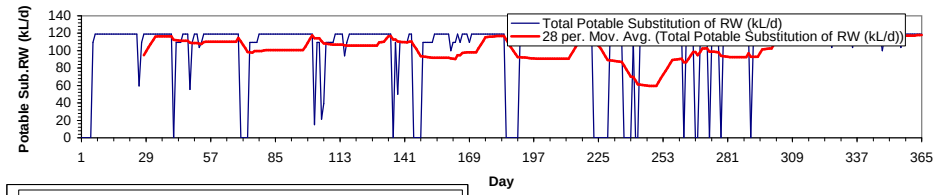


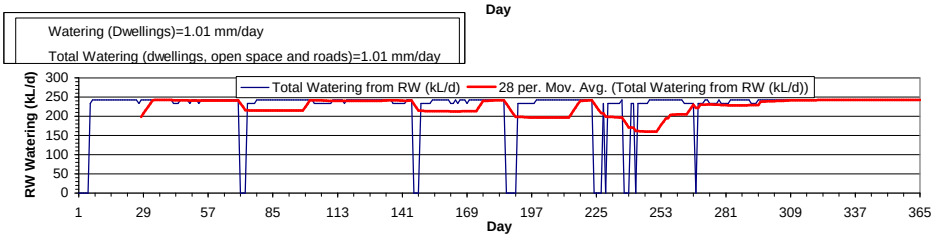


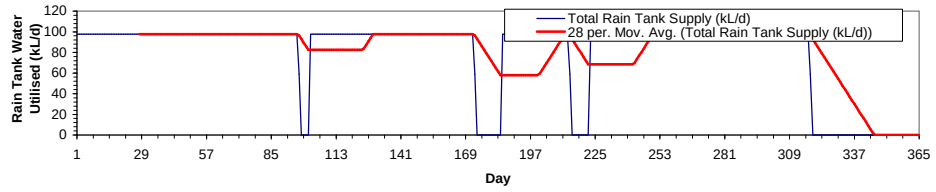
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 25kL tank - Dry Rainfall Year

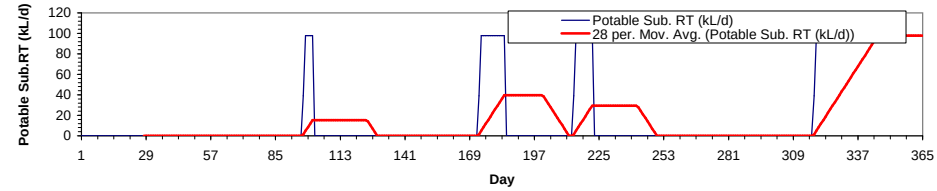


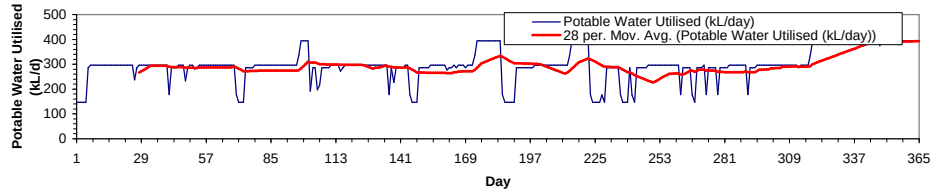


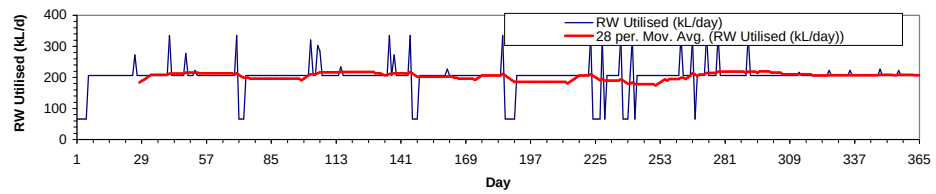




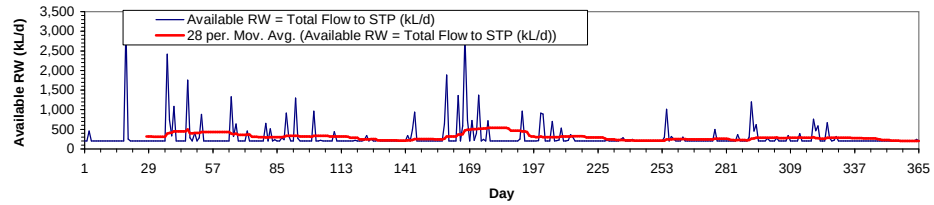


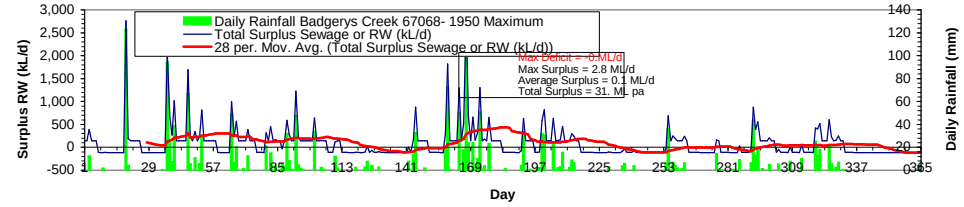


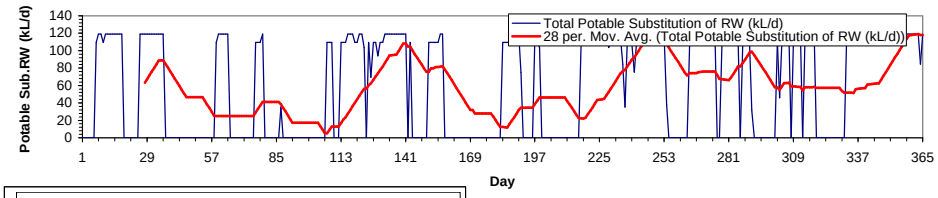


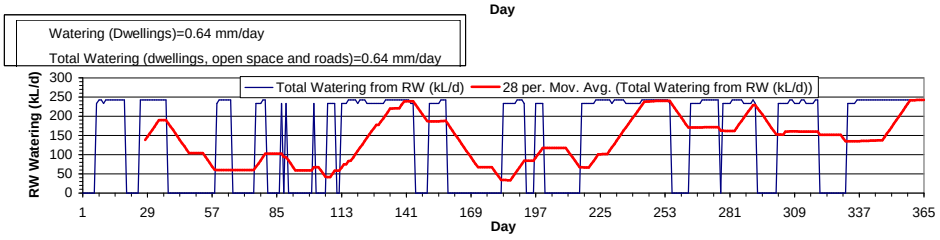


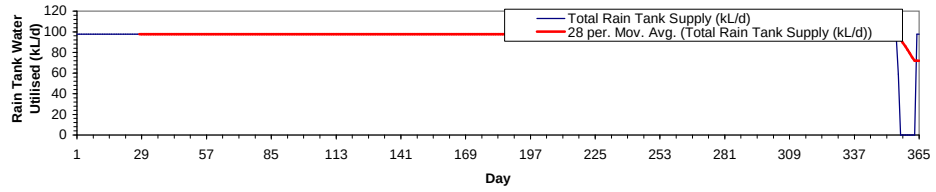
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 25kL tank - Wet Rainfall Year

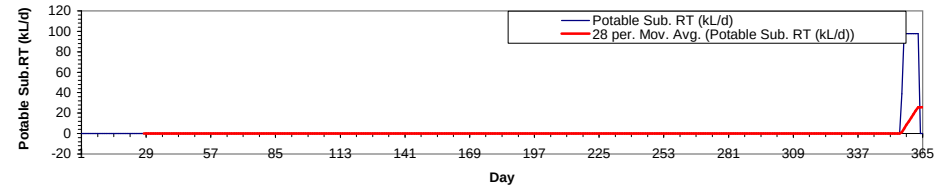


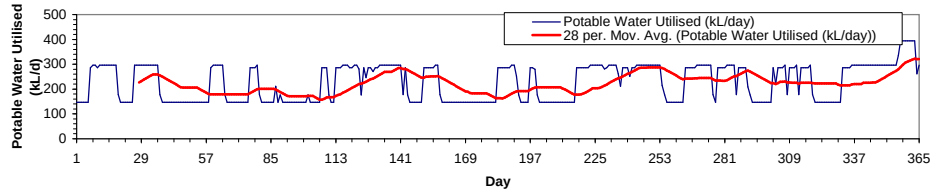


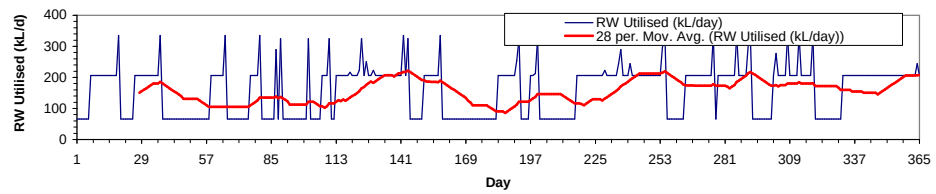




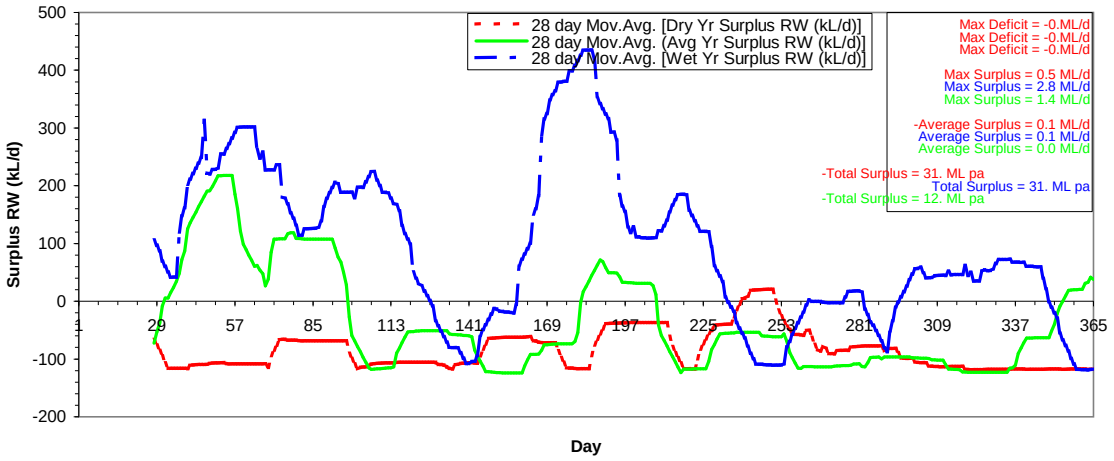


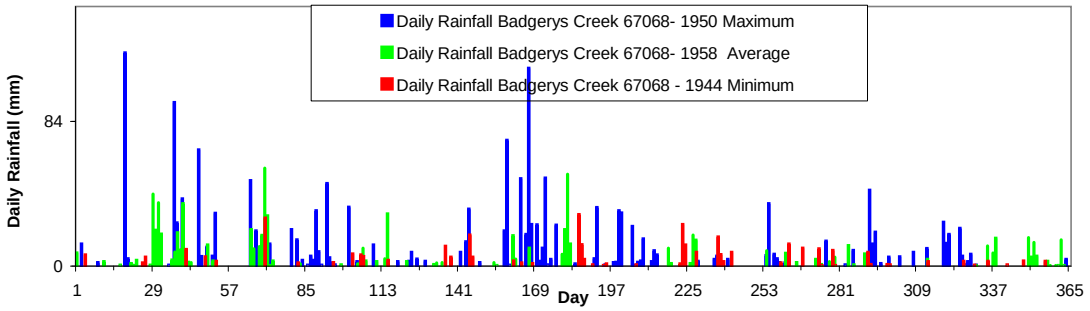




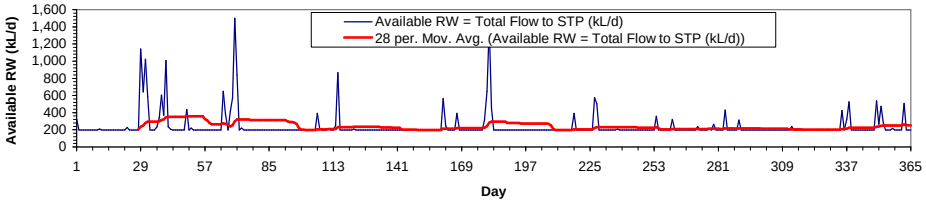


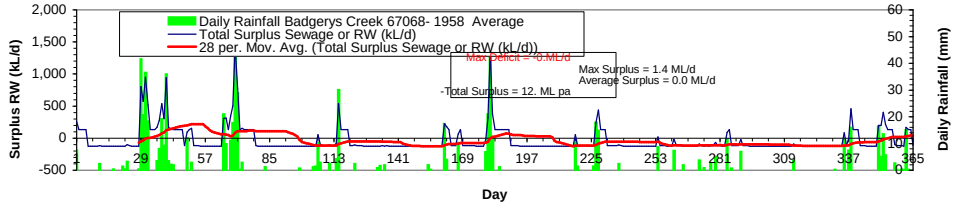
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 30kL tank

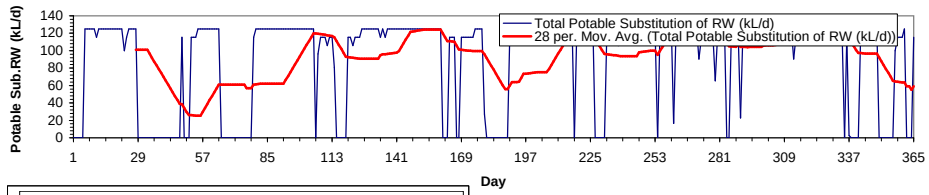


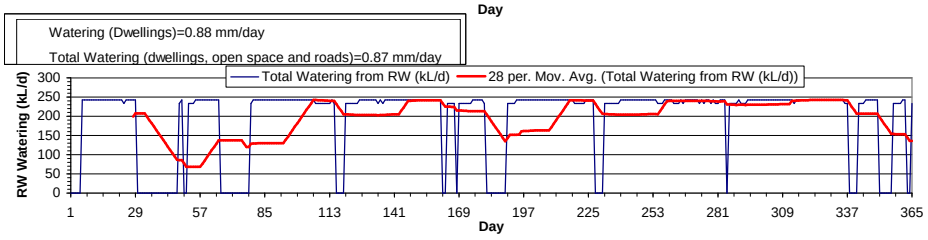


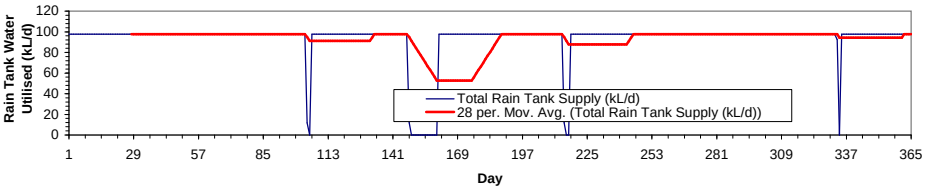
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 30kL tank - Average Rainfall Year

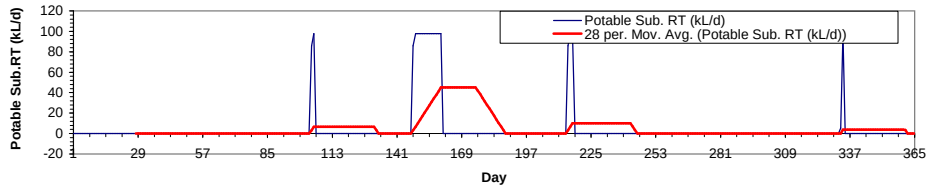


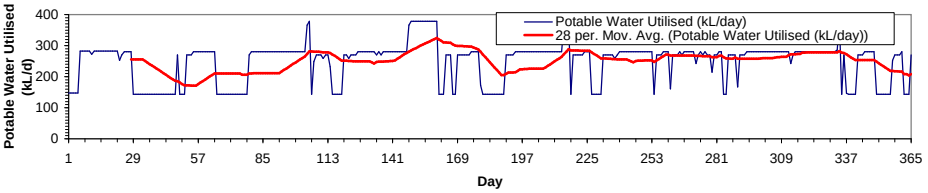


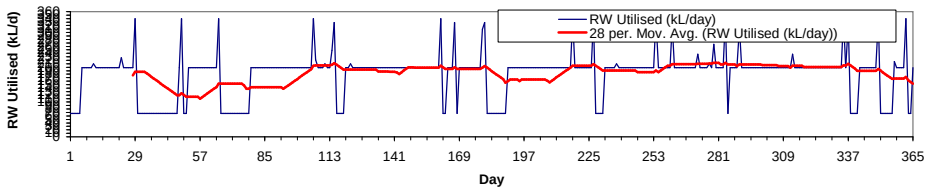




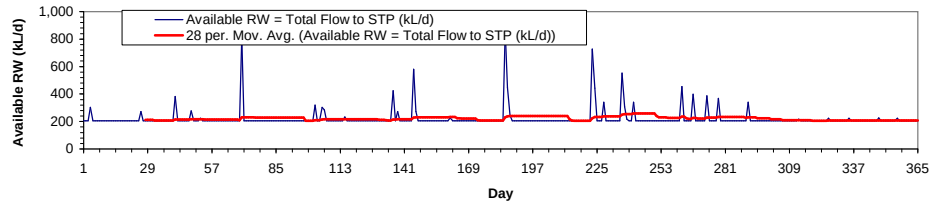


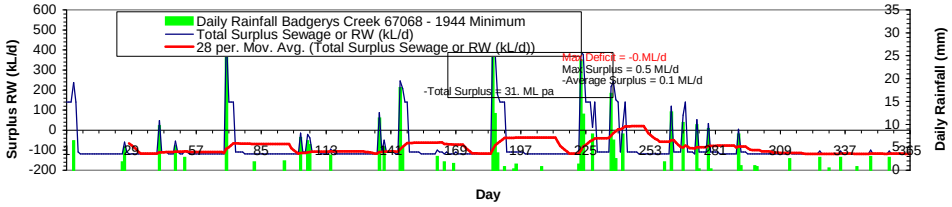


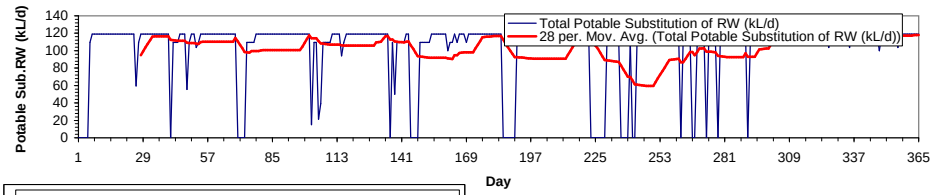


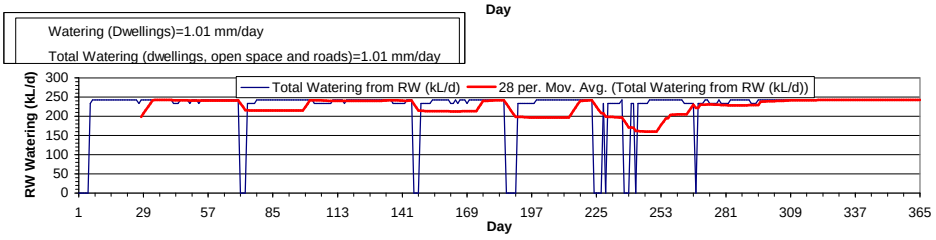


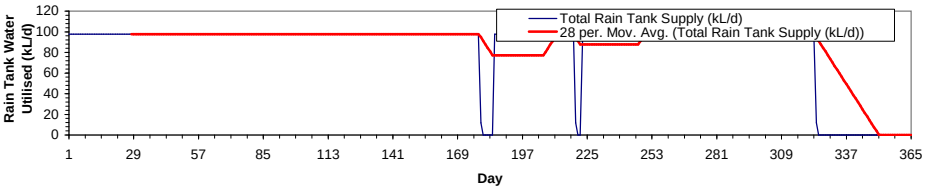
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 30kL tank - Dry Rainfall Year

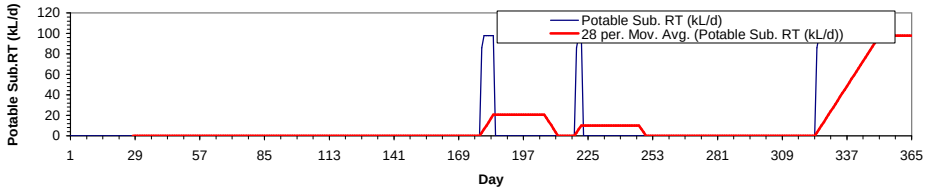


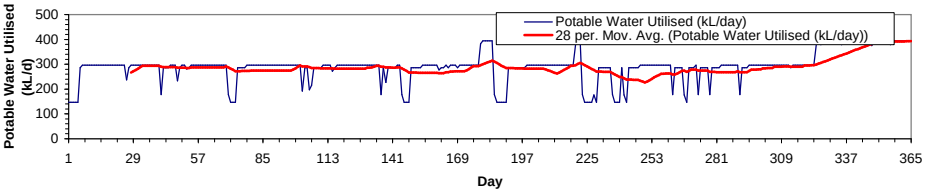


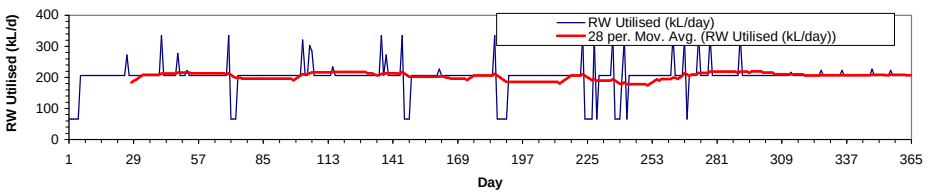




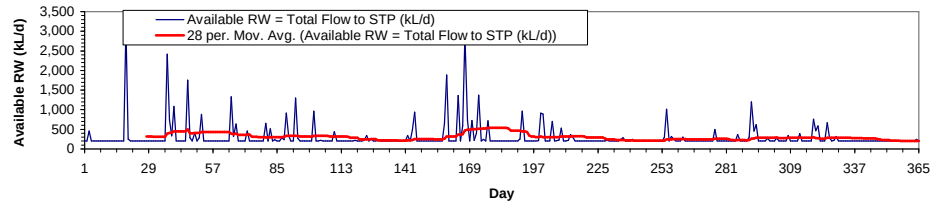


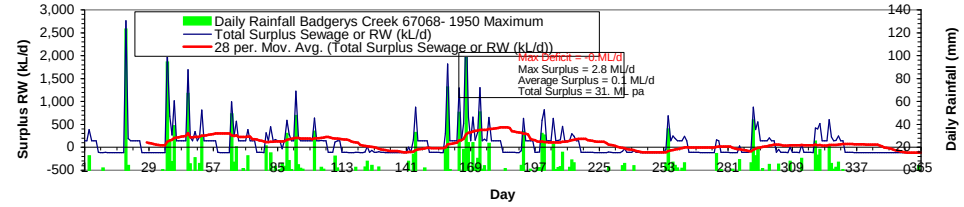


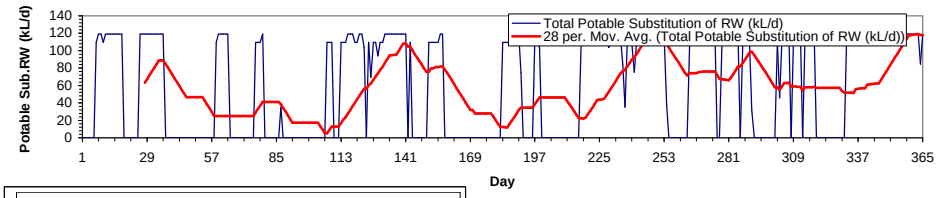


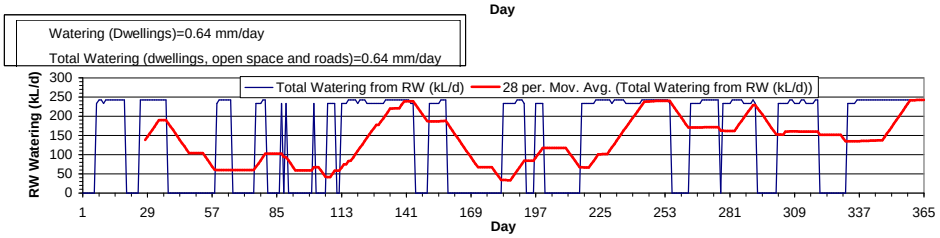


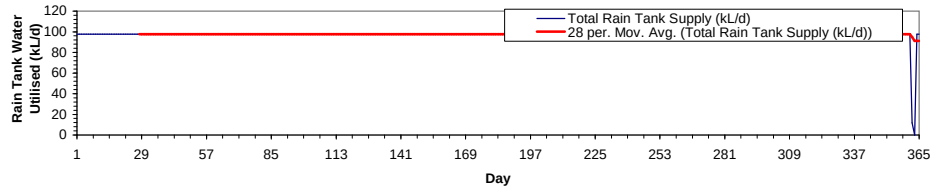
Scenario 4- Stage 3- Rainwater tank to supply toilet and truck wash, 30kL tank - Wet Rainfall Year

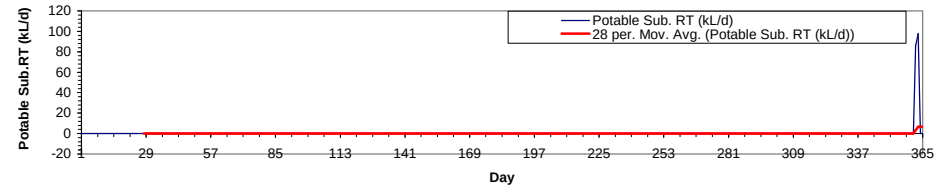


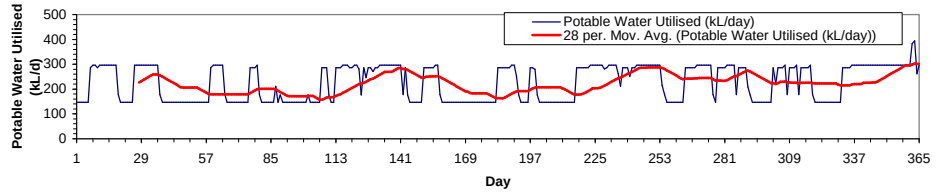


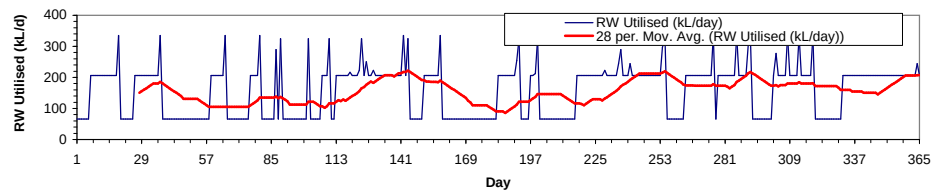




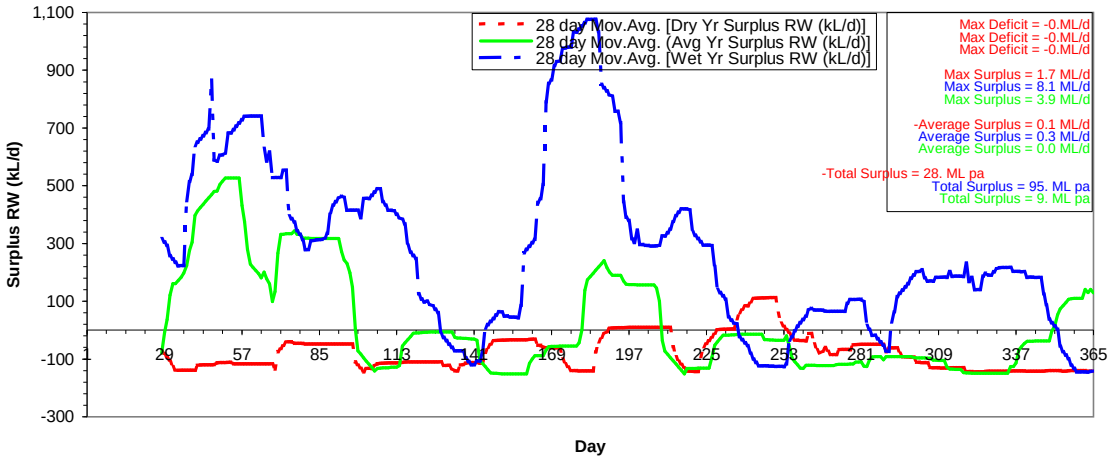


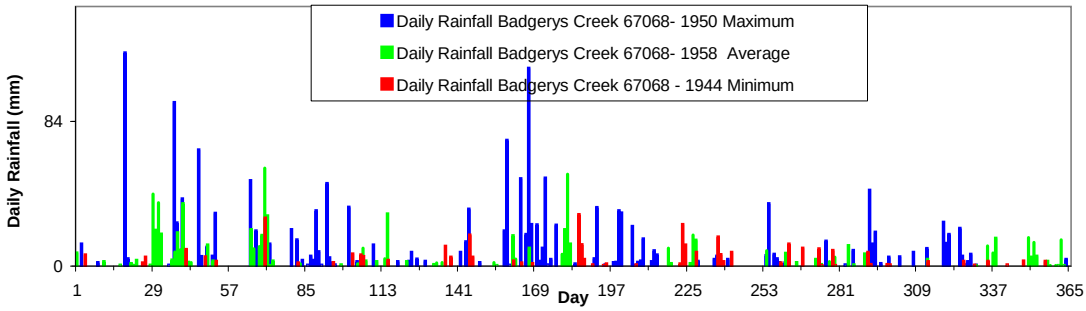




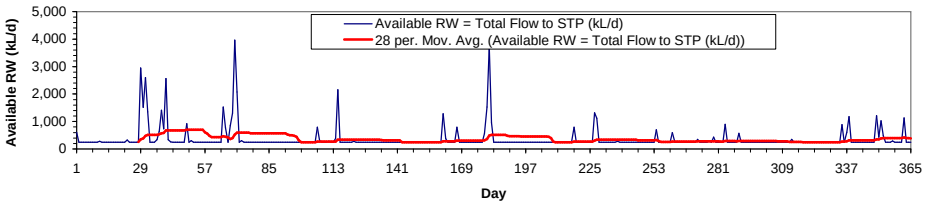


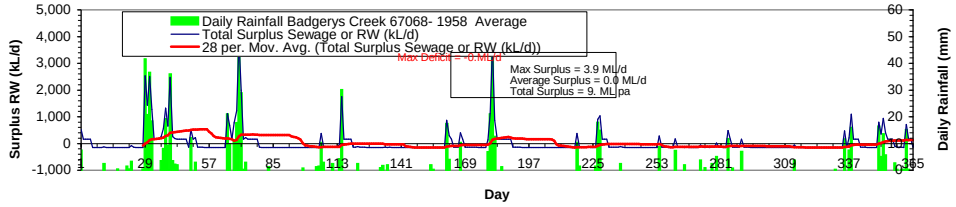
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 25kL tank

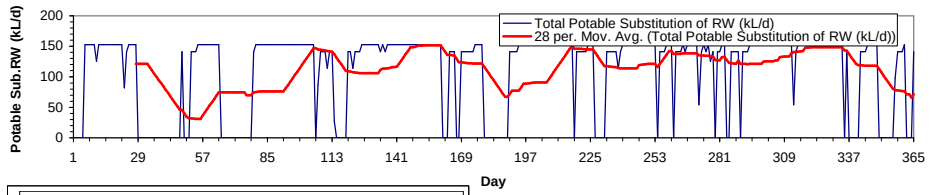


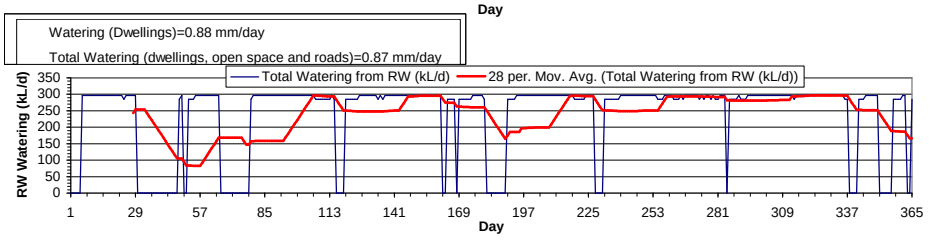


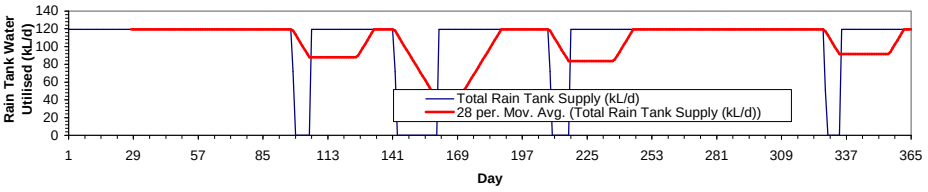
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 25kL tank - Average Rainfall Year

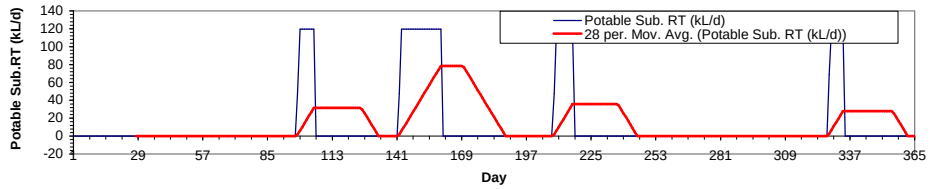


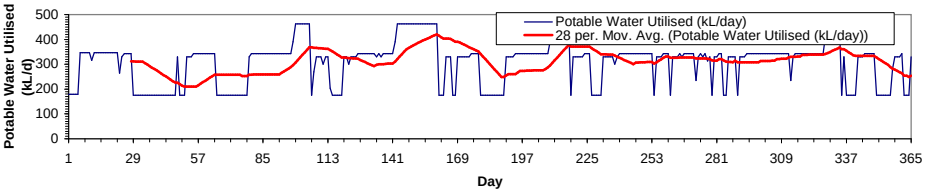


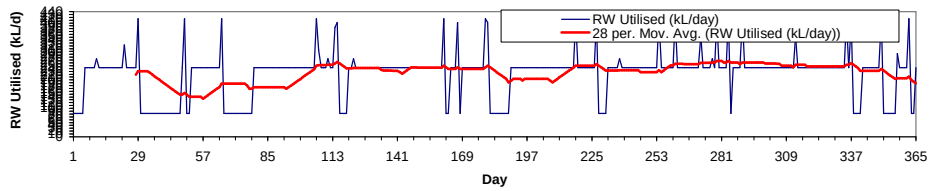




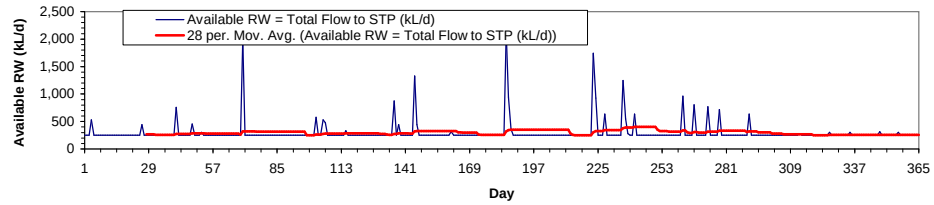


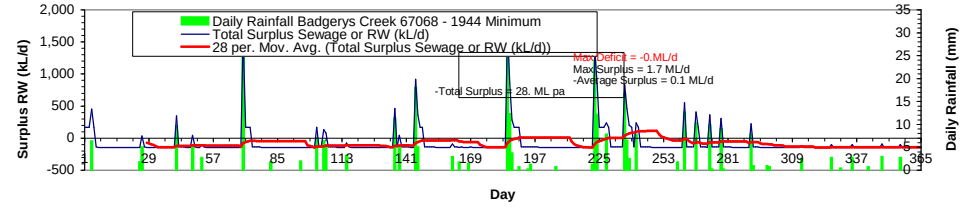


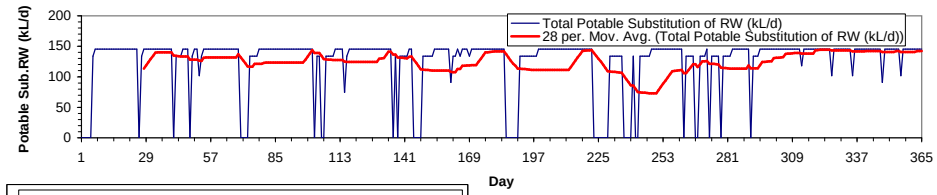


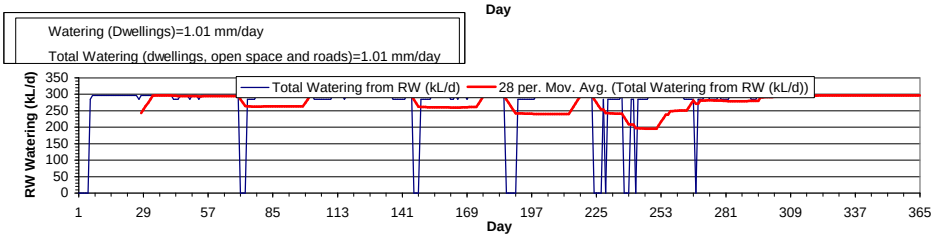


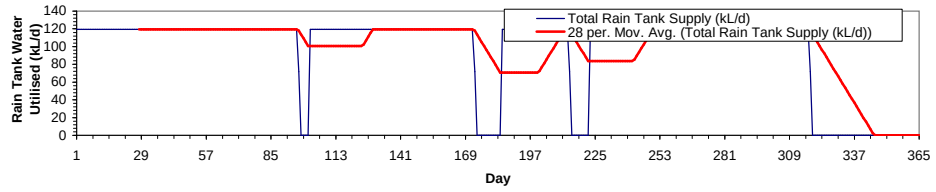
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 25kL tank - Dry Rainfall Year

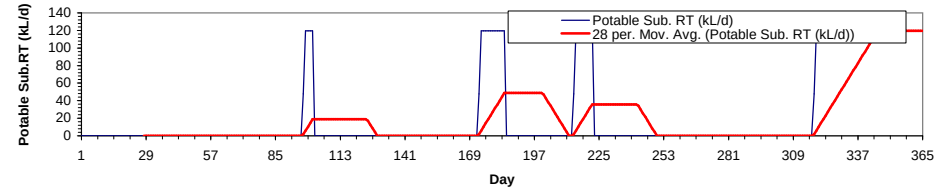


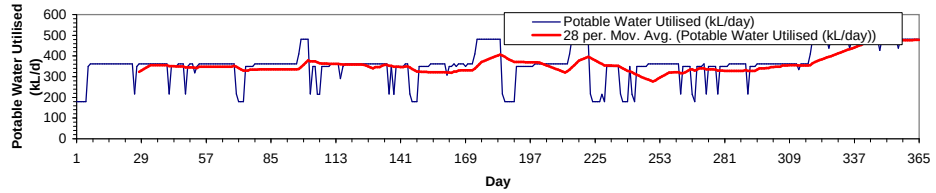


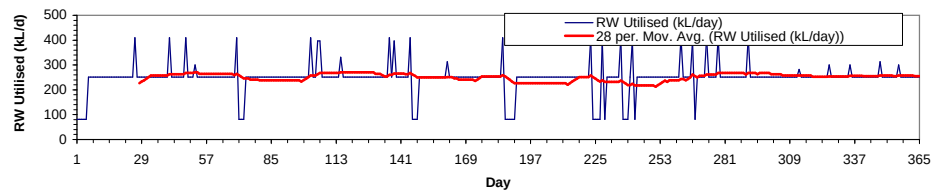




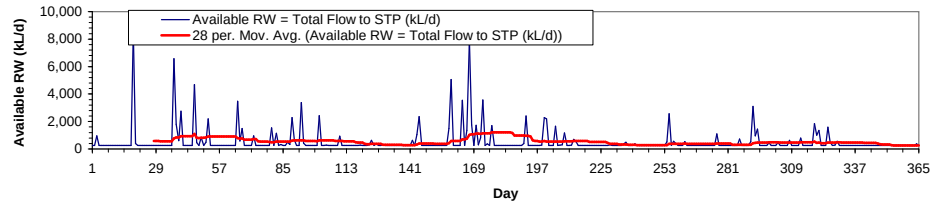


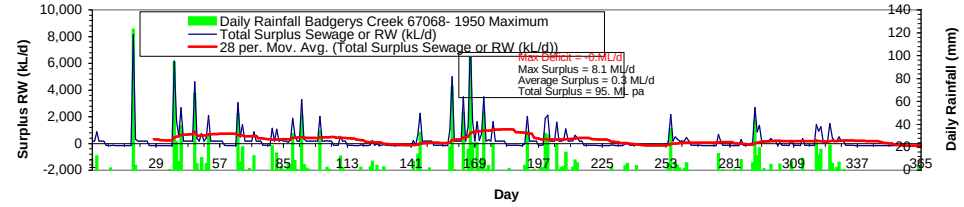


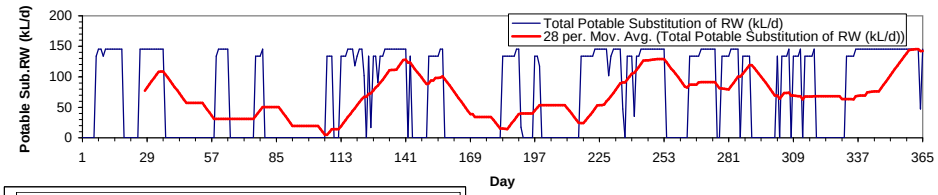


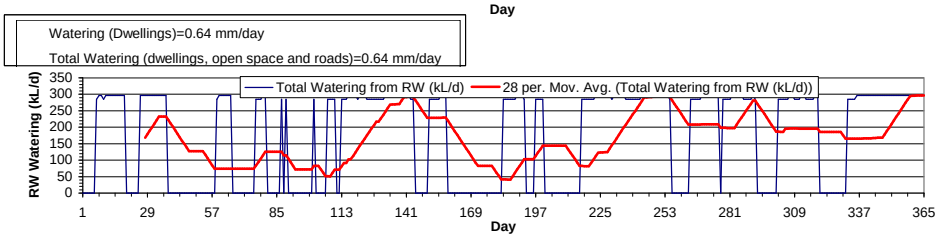


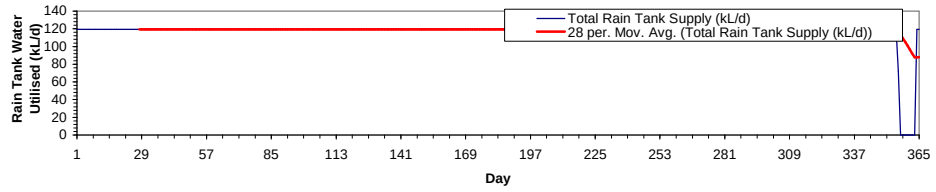
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 25kL tank - Wet Rainfall Year

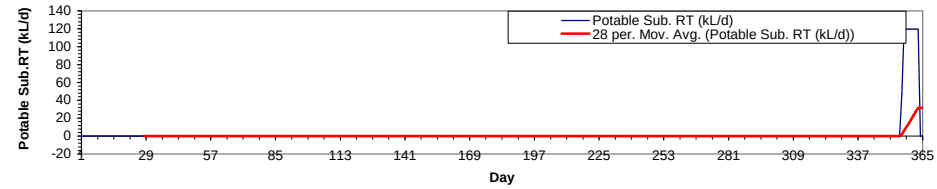


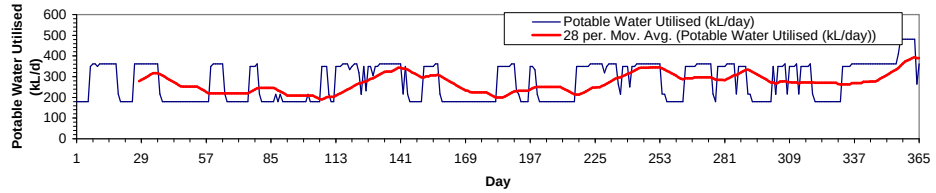


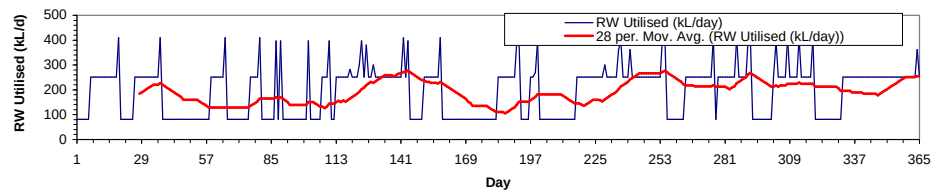




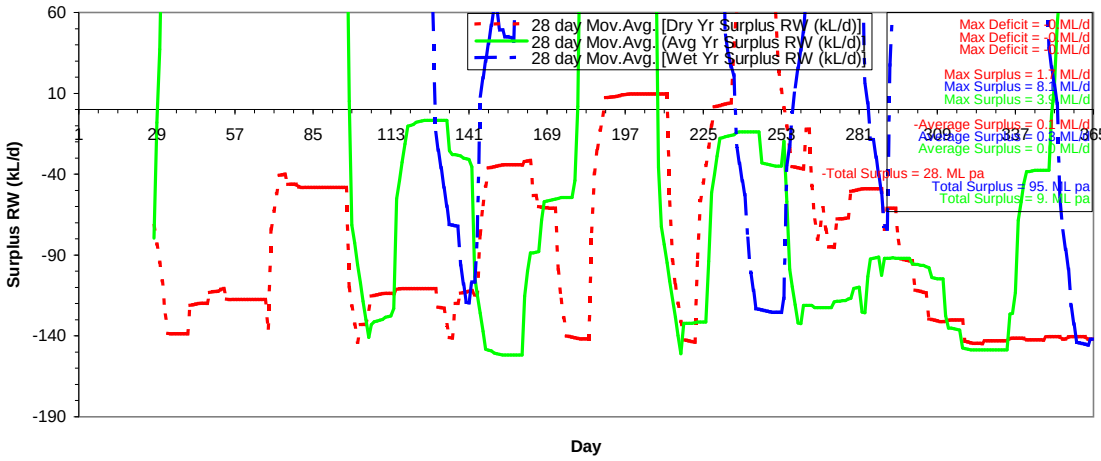


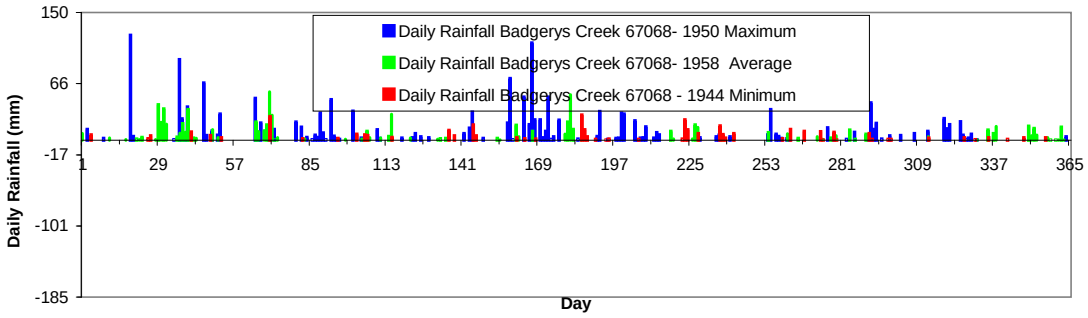




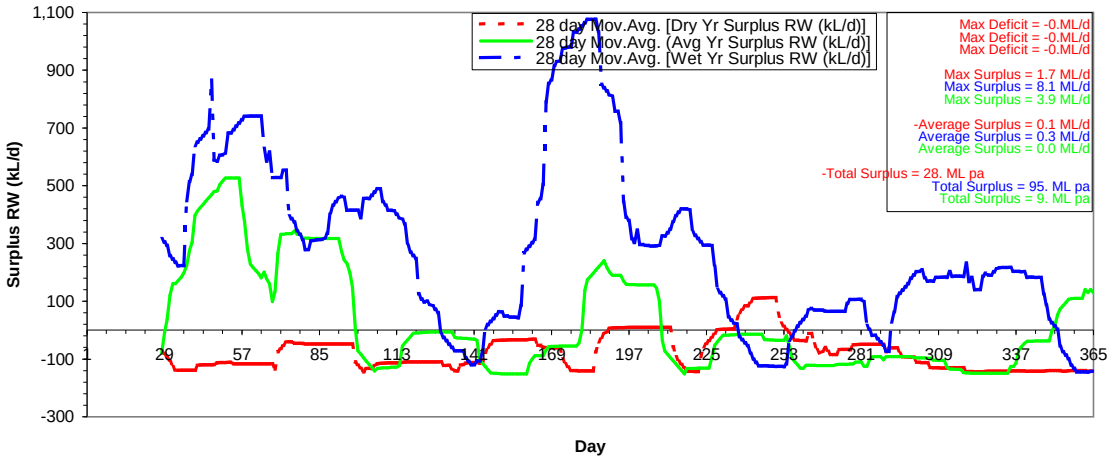


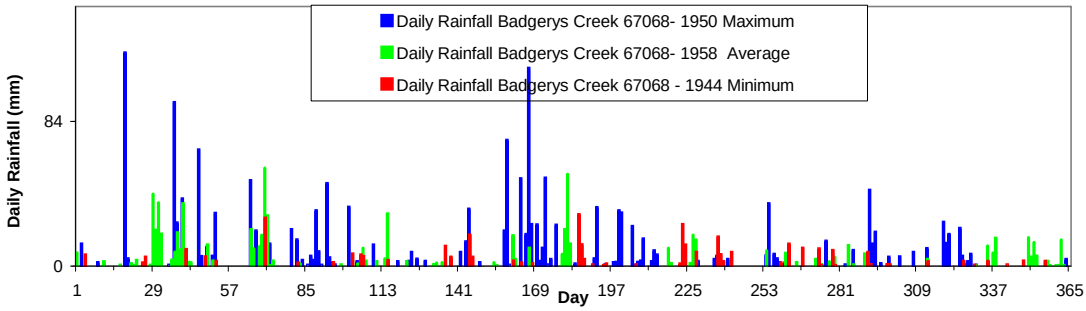
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 30kL tank



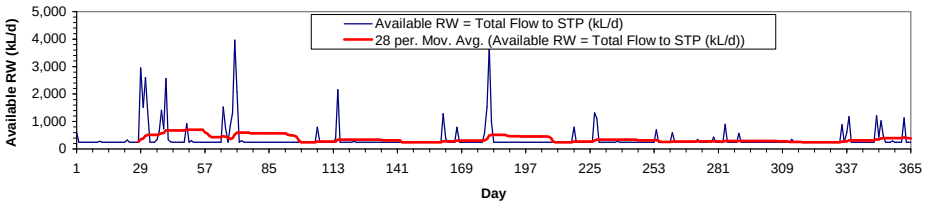


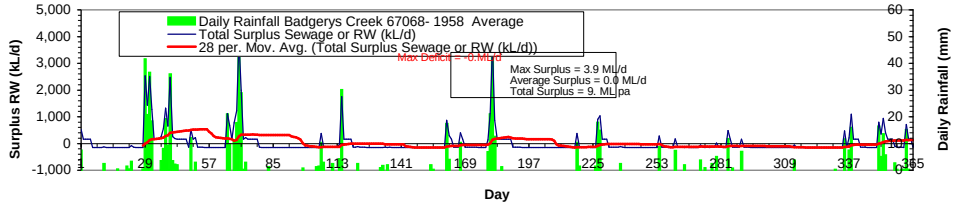
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 30kL tank

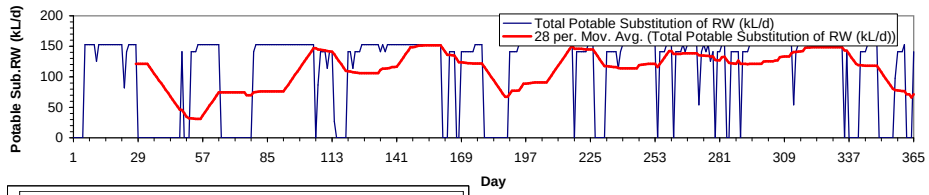


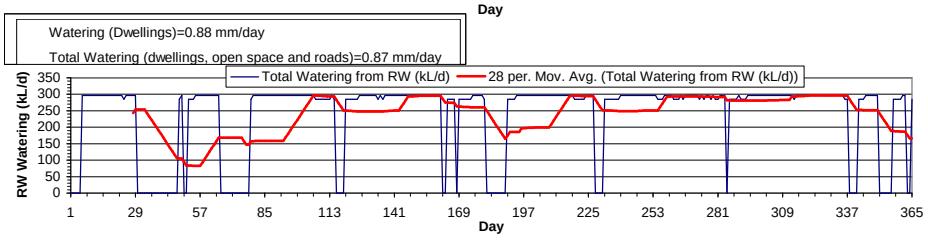


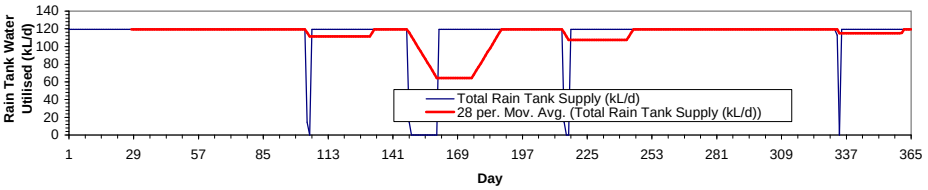
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 30kL tank - Average Rainfall Year

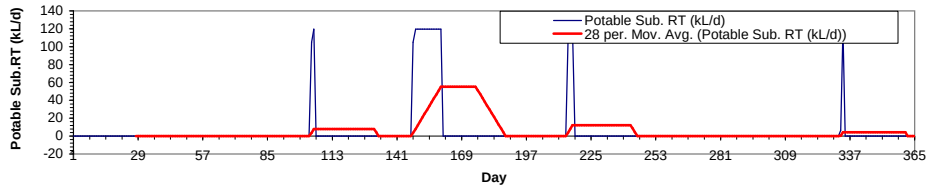


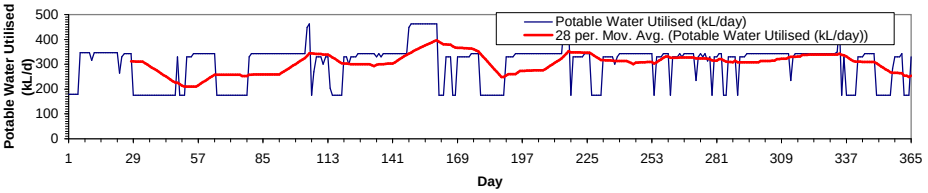


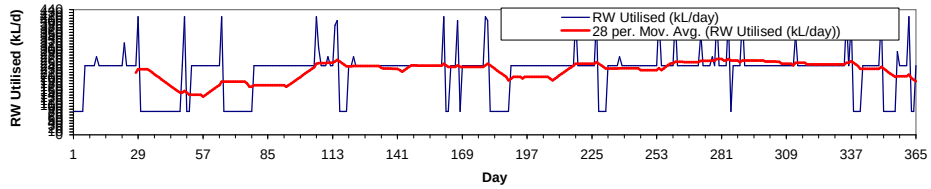




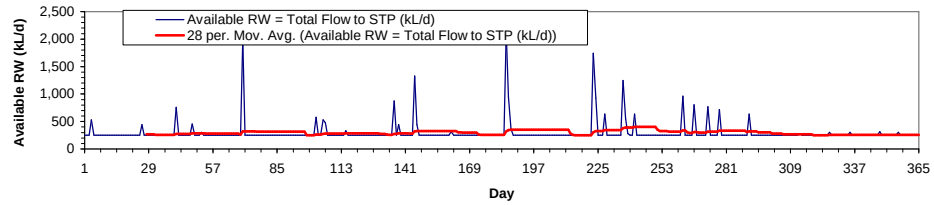


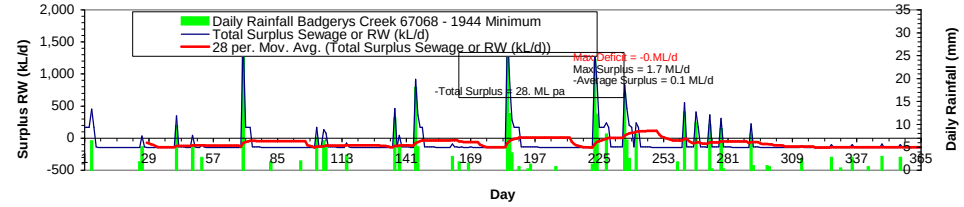


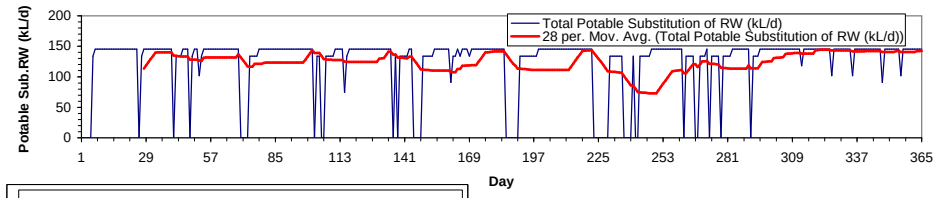


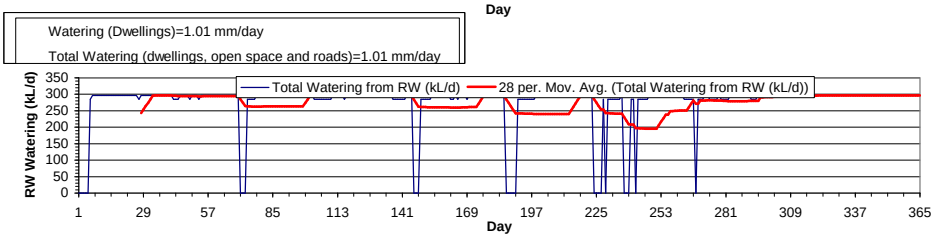


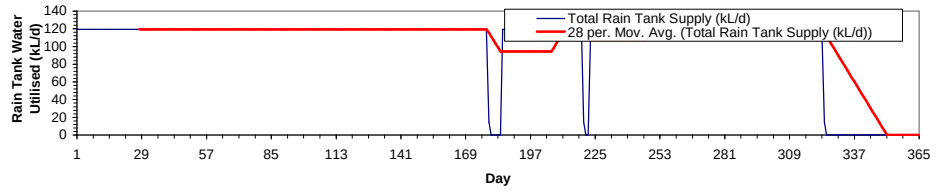
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 30kL tank - Dry Rainfall Year

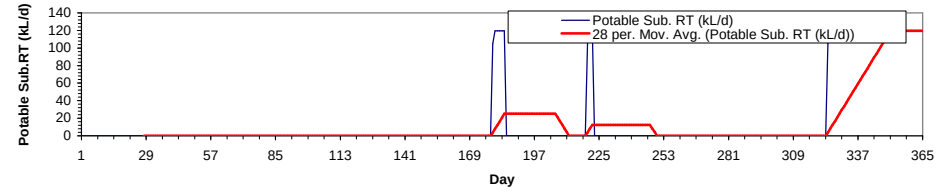


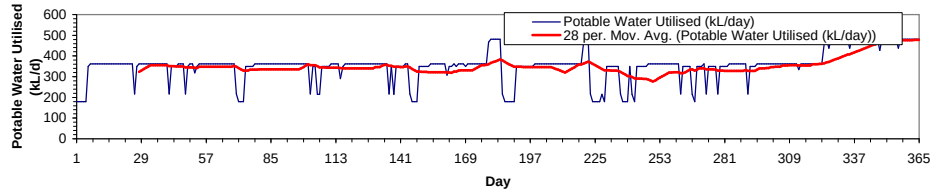


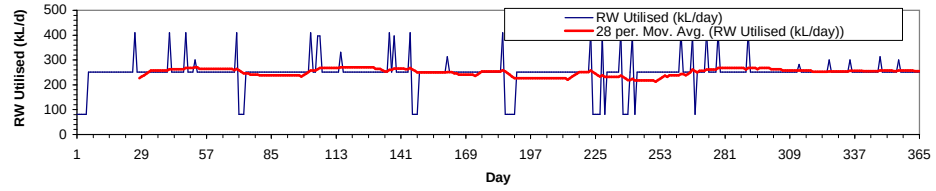




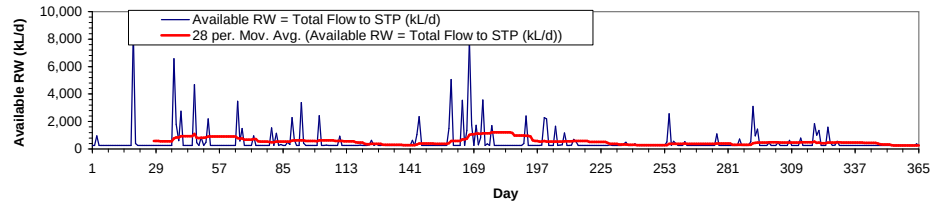


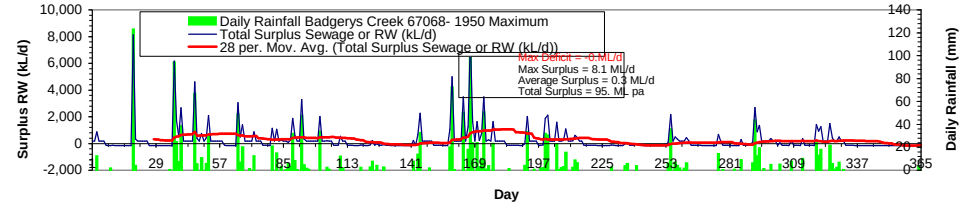


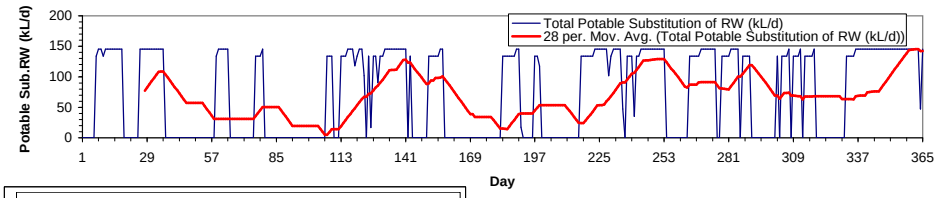


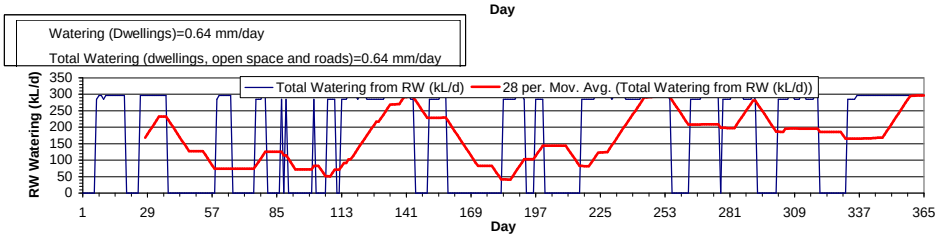


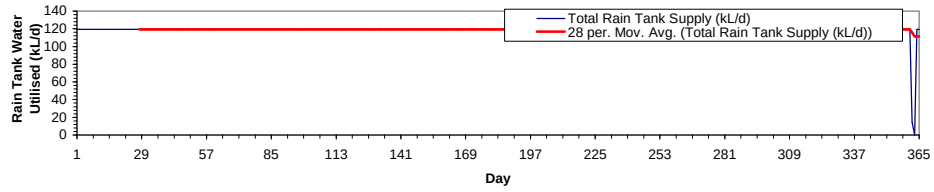
Scenario 4- Stage 4- Rainwater tank to supply toilet and truck wash, 30kL tank - Wet Rainfall Year

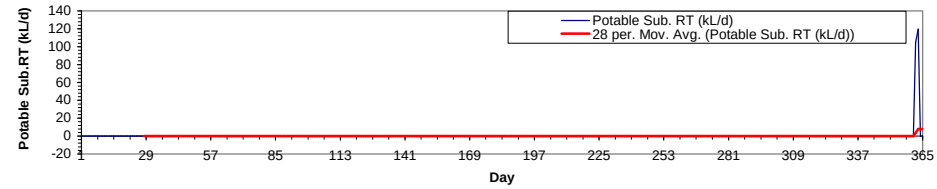


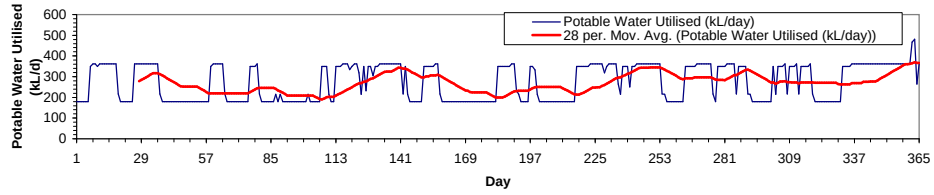


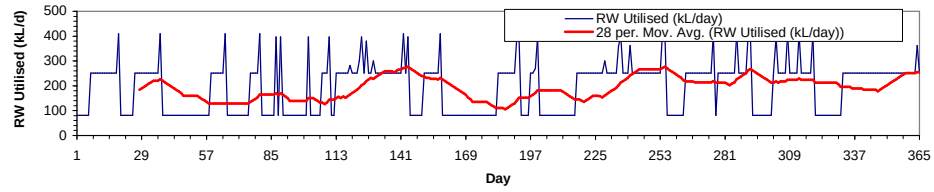




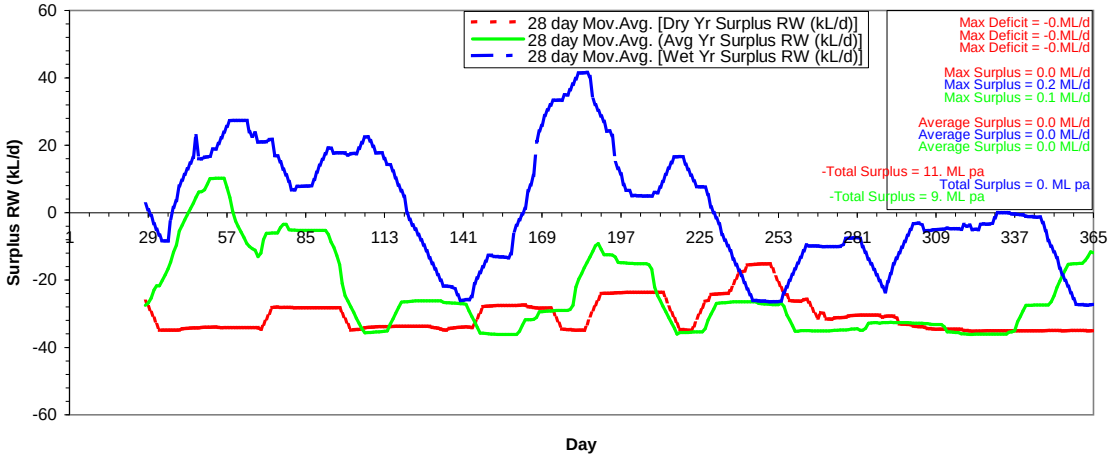


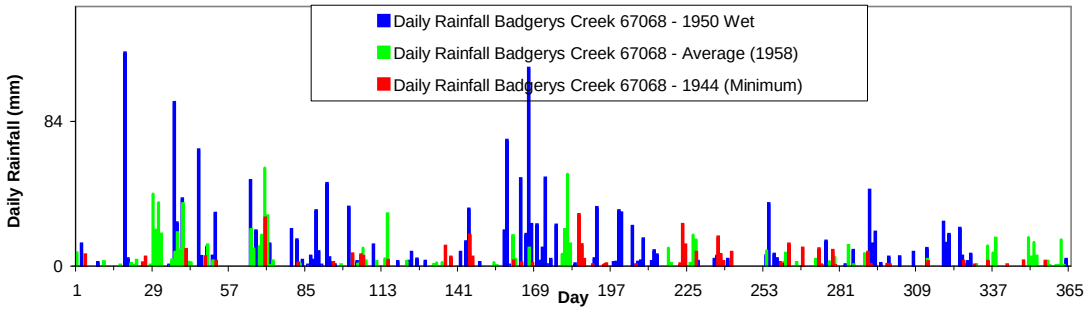




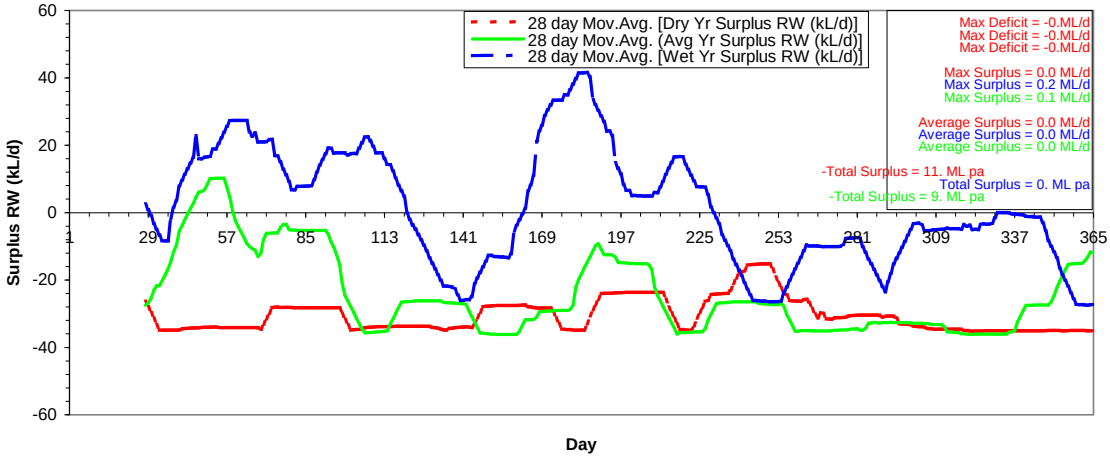


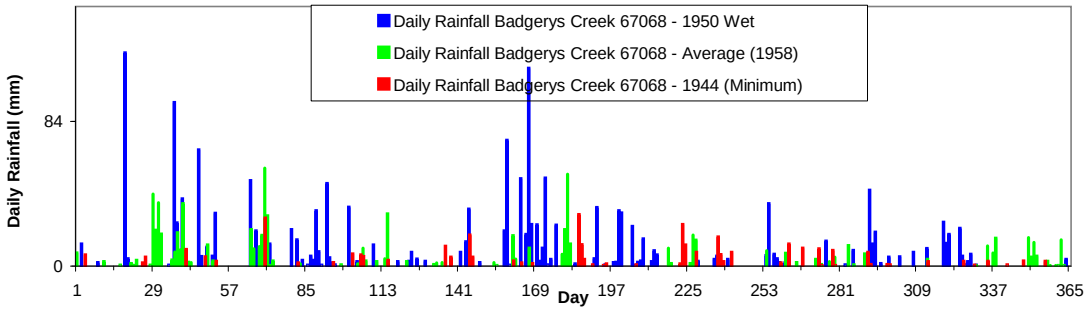
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank



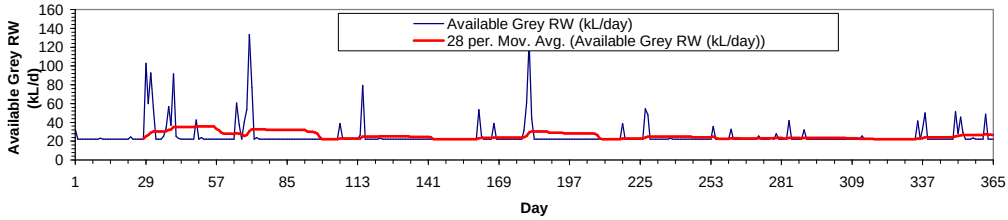


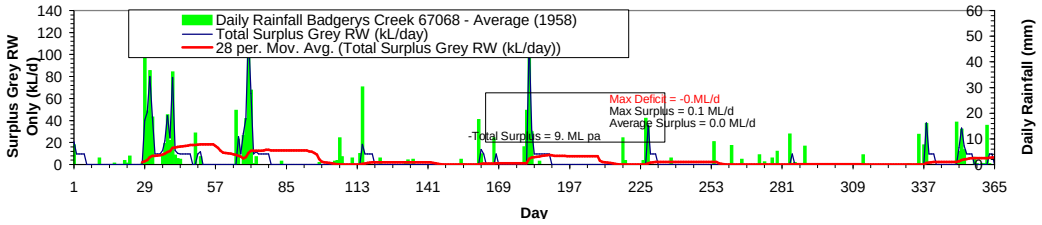
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank

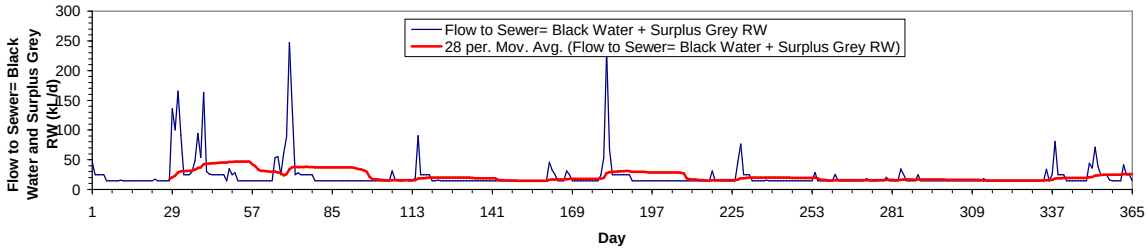


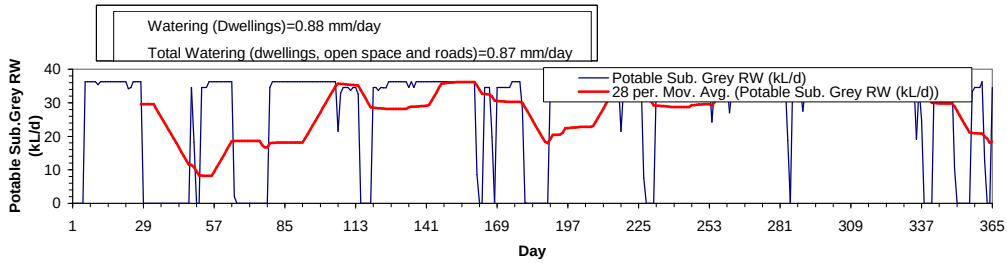


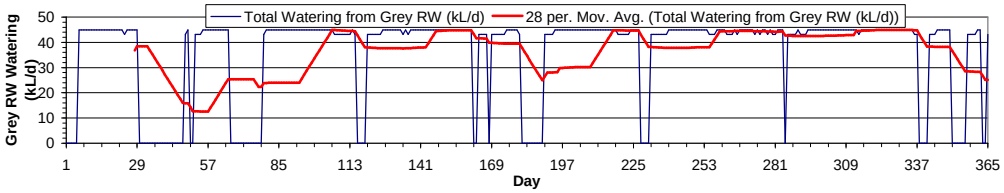
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank - Average Rainfall Year

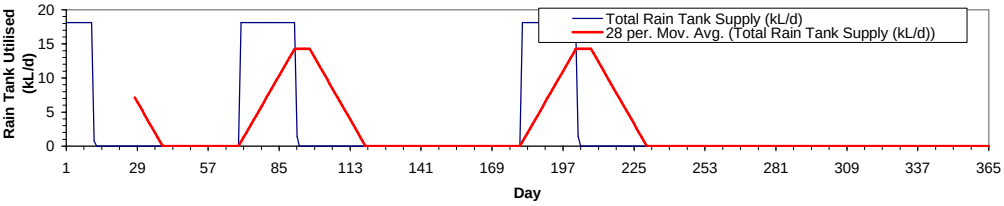


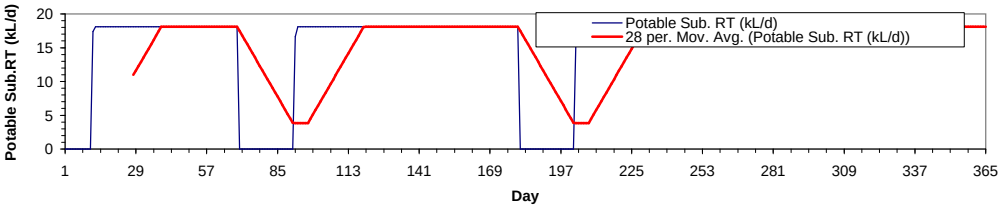




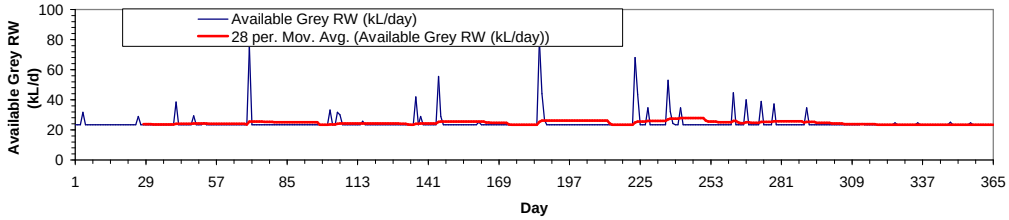


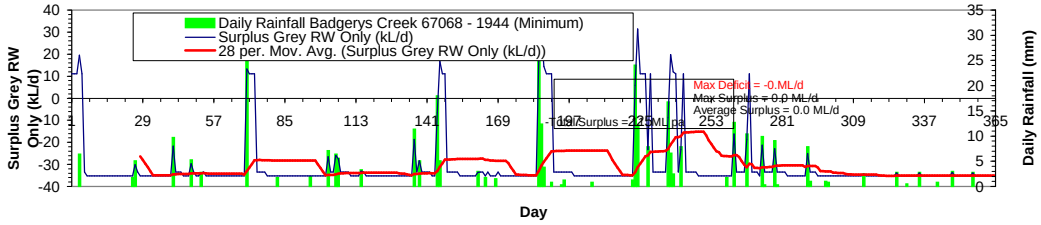


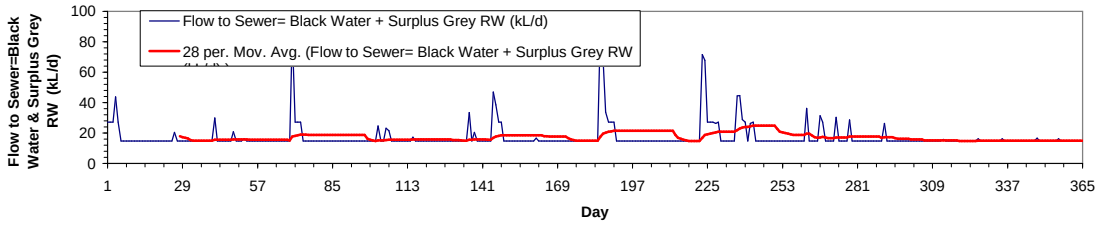


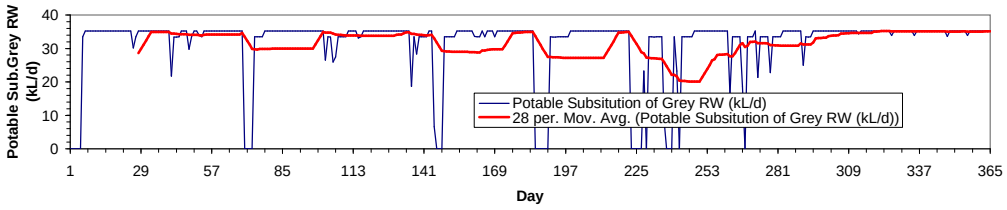


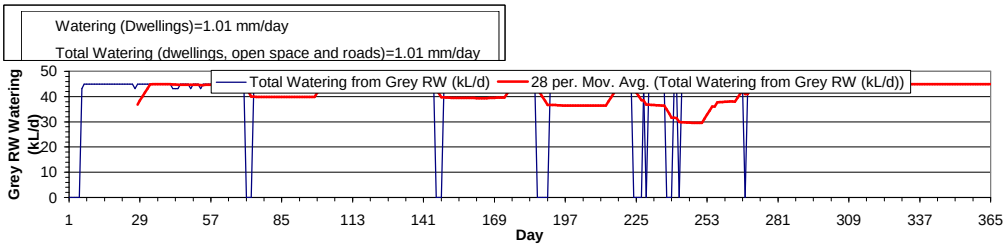
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank - Dry Rainfall Year

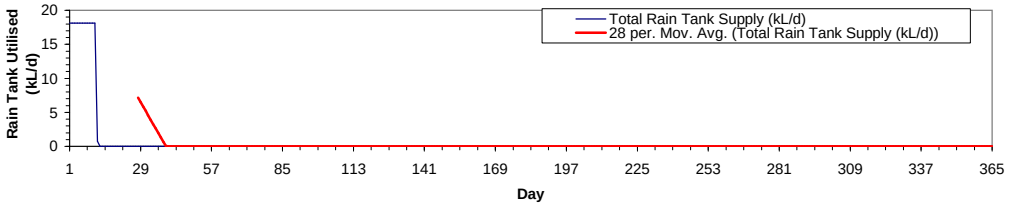


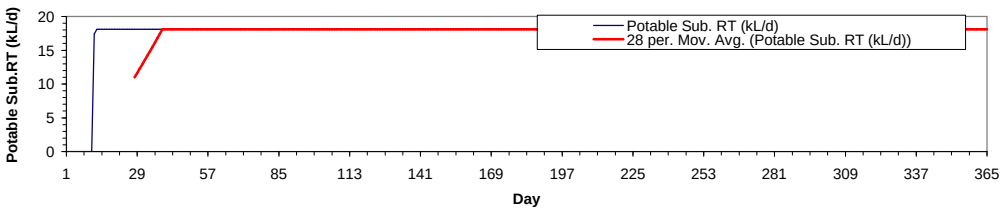




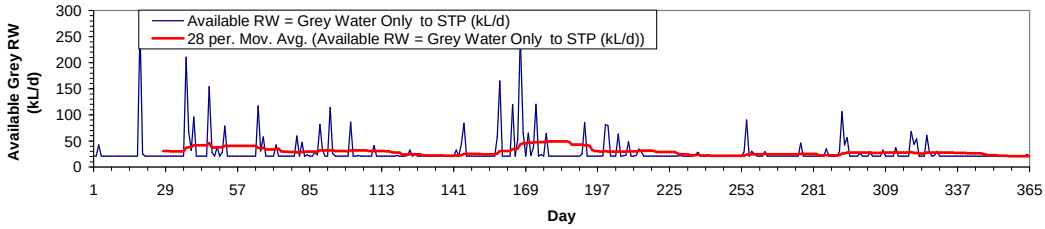


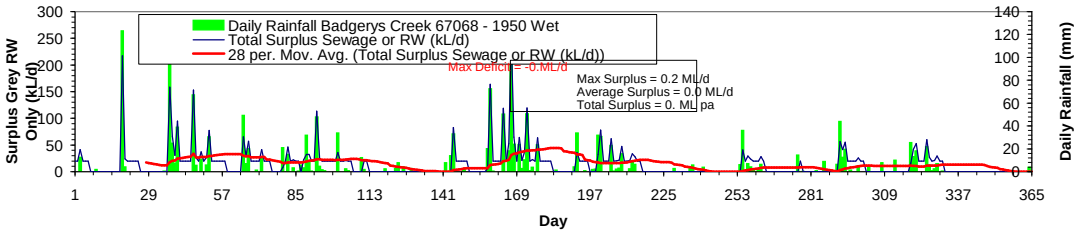


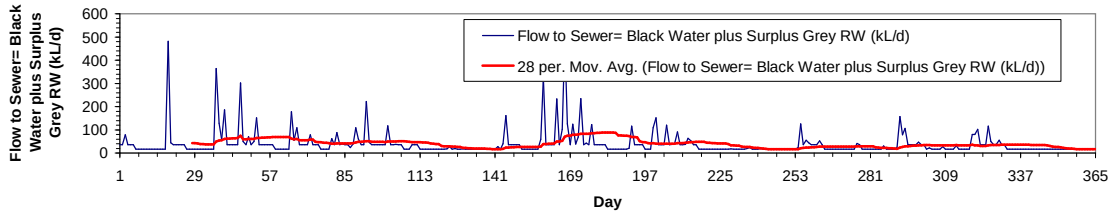


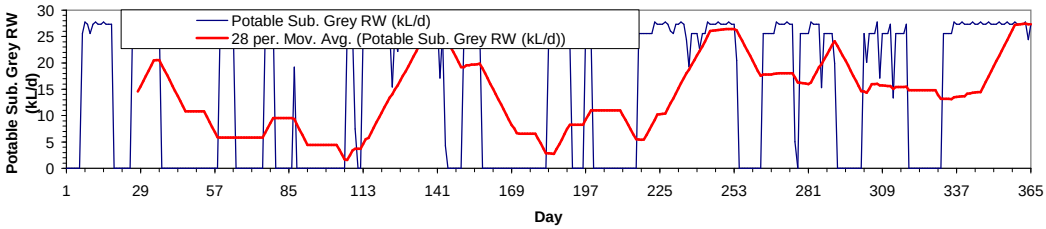


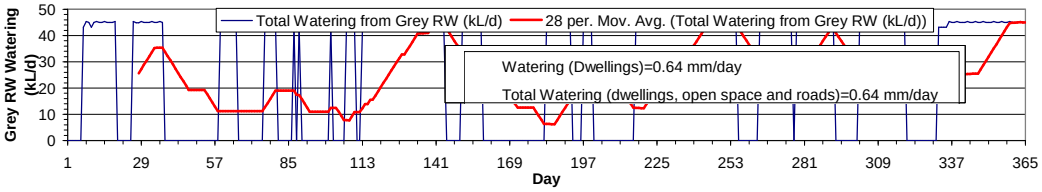
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank - Wet Rainfall Year

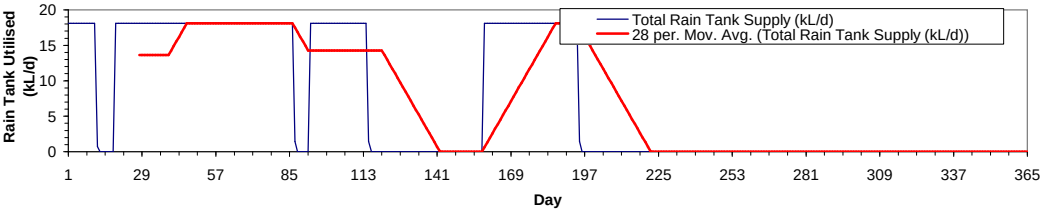


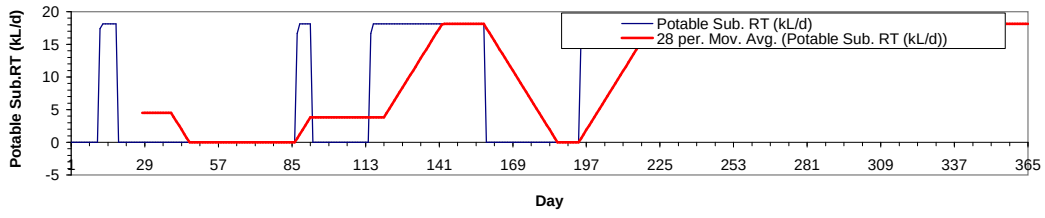




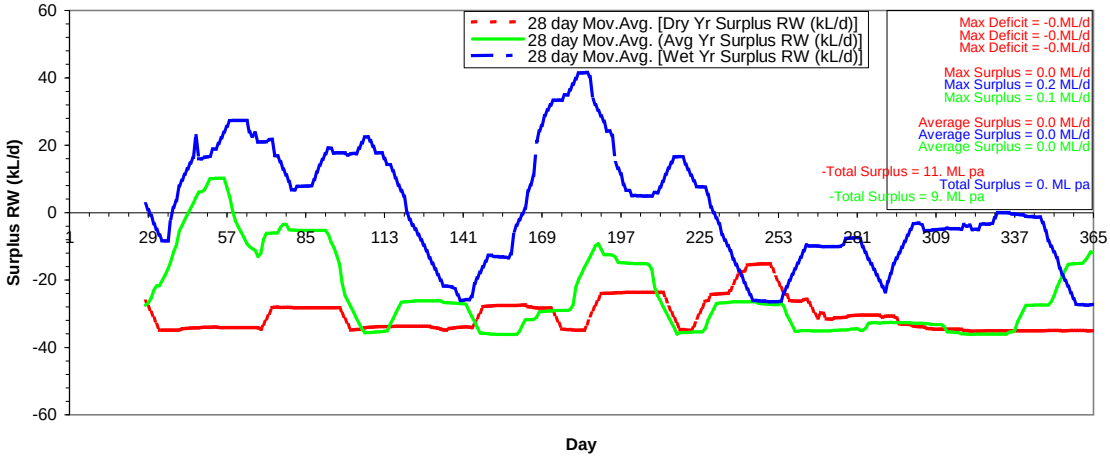


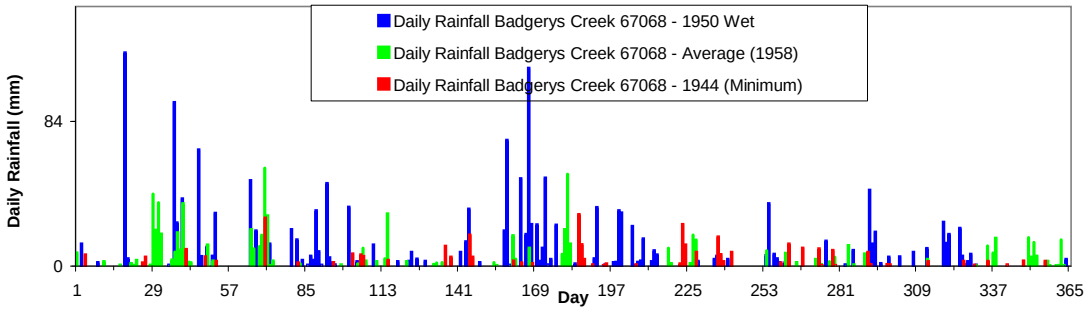


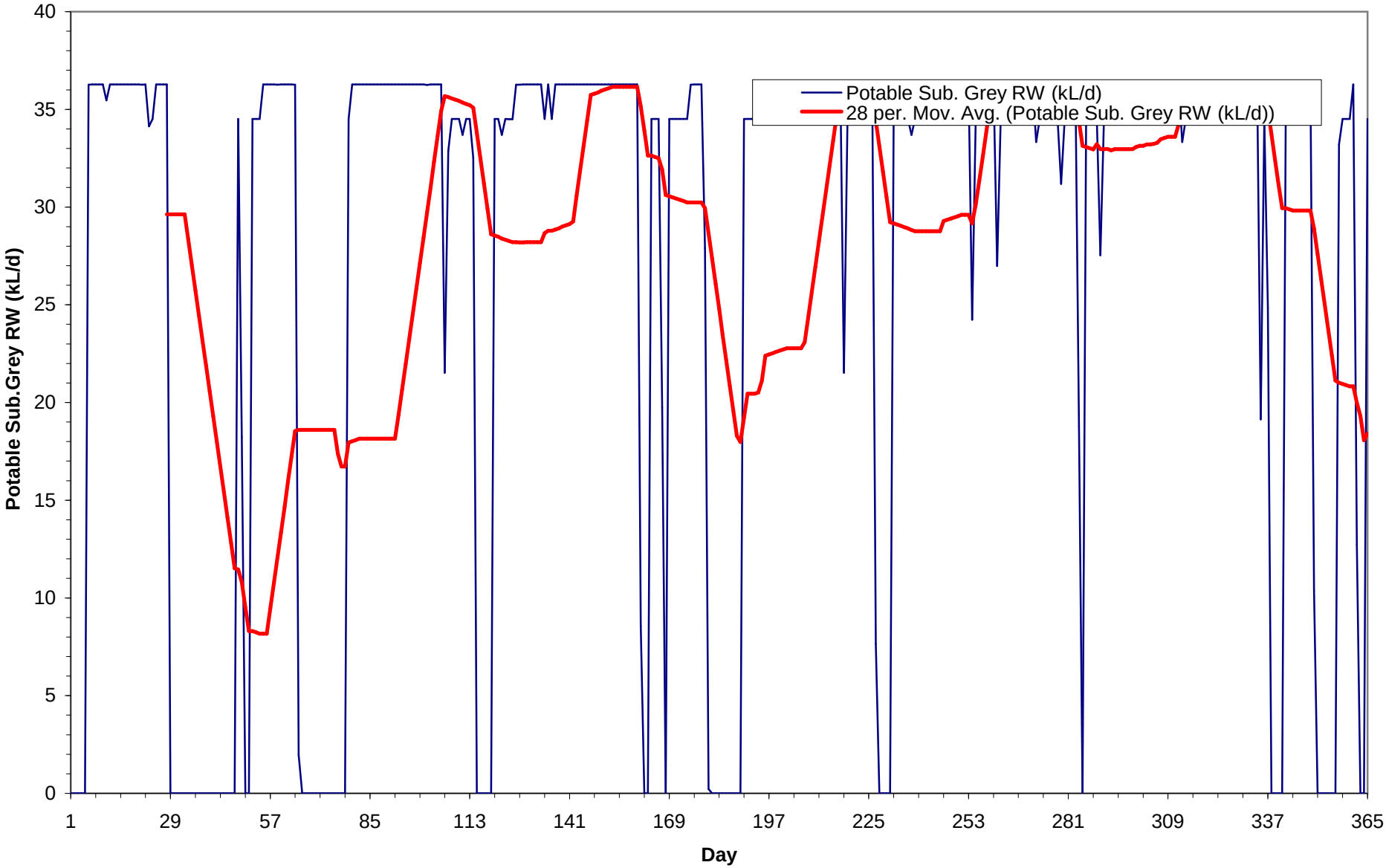




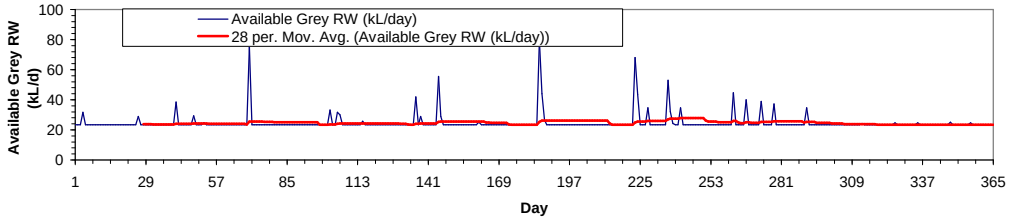
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank

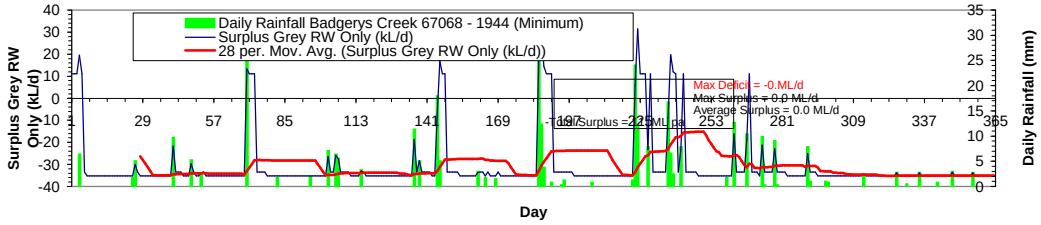


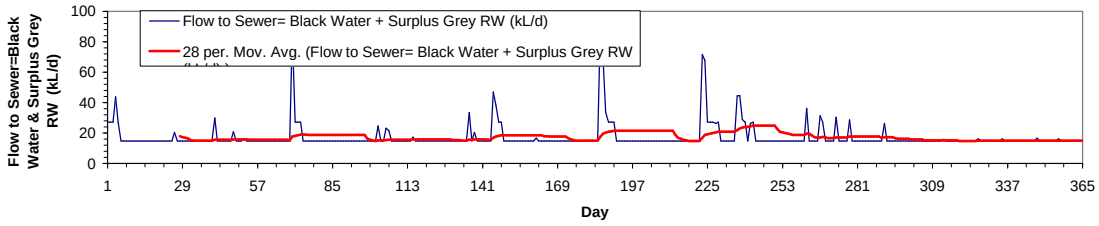


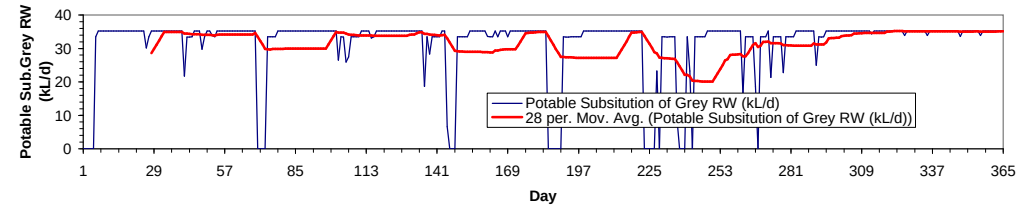

Potable Sub. Grey RW (kL/d)
28 per. Mov. Avg. (Potable Sub. Grey RW (kL/d))
Potable Sub.Grey RW (kL/d)
Day
0
5
10
15
20
25
30
35
40
1
29
57
85
113
141
169
197
225
253
281
309
337
365

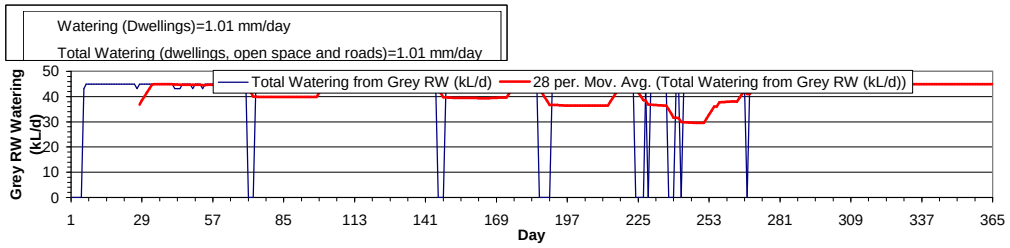
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank - Dry Rainfall Year

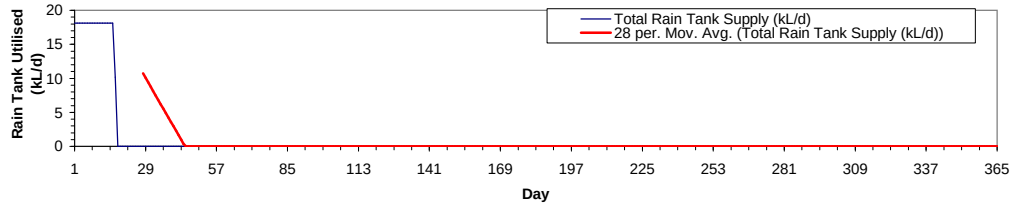


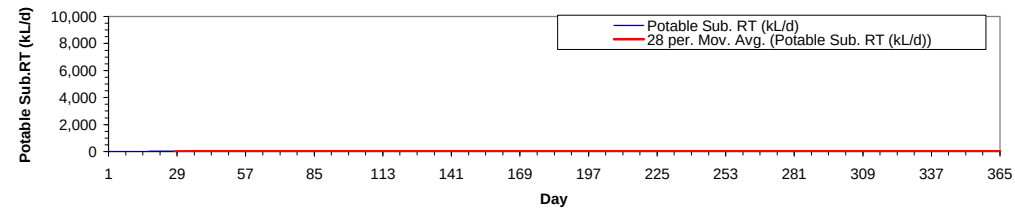




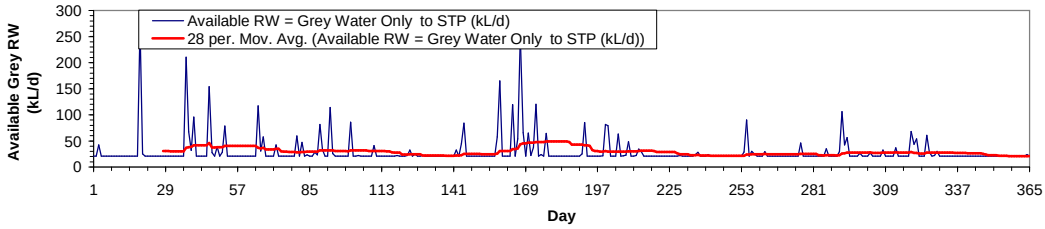


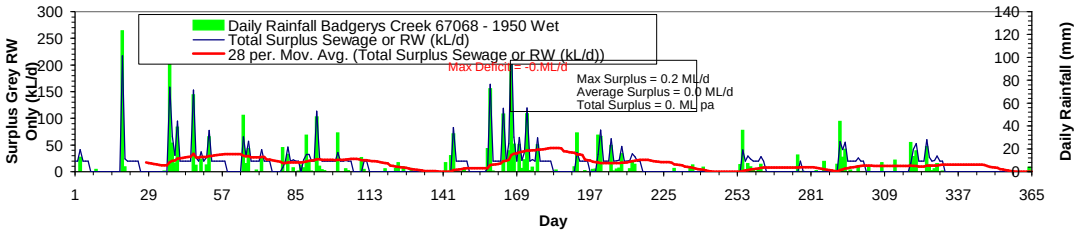


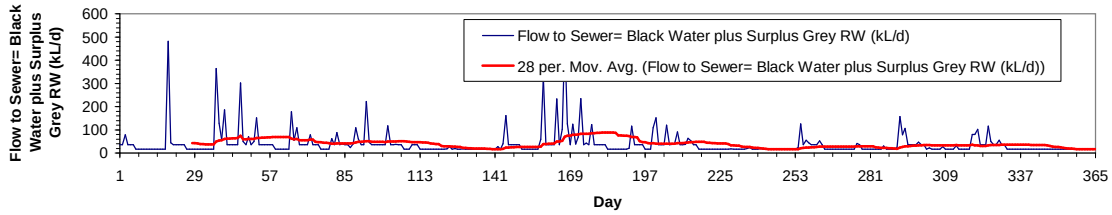


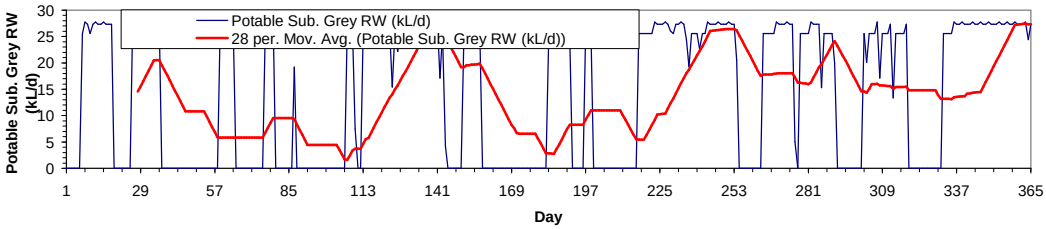


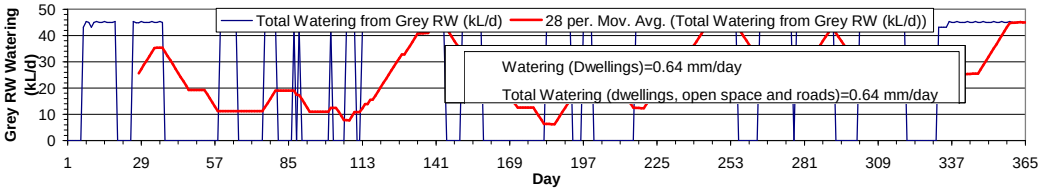
Scenario 5- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank - WetRainfall Year

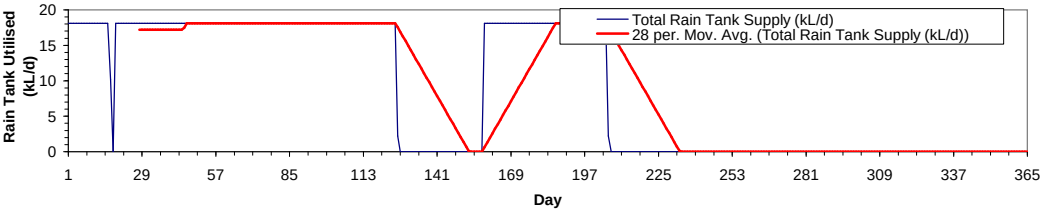


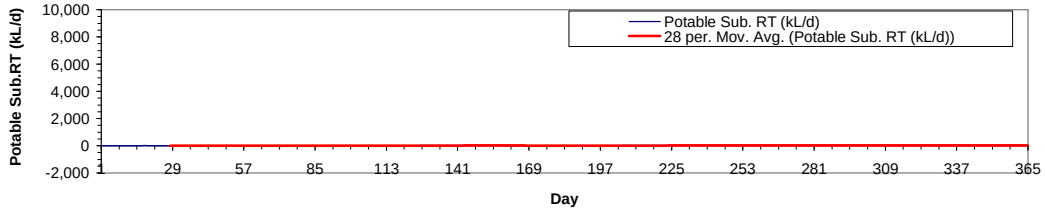




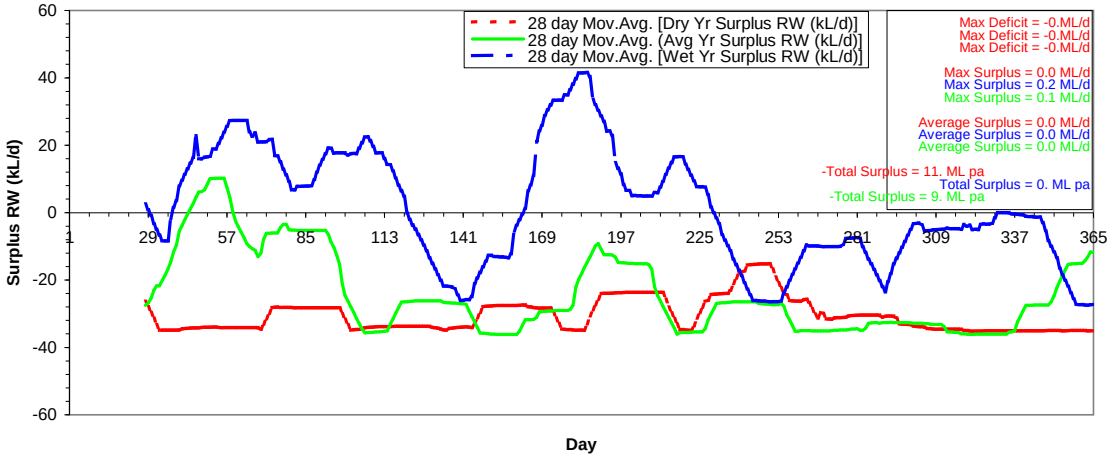


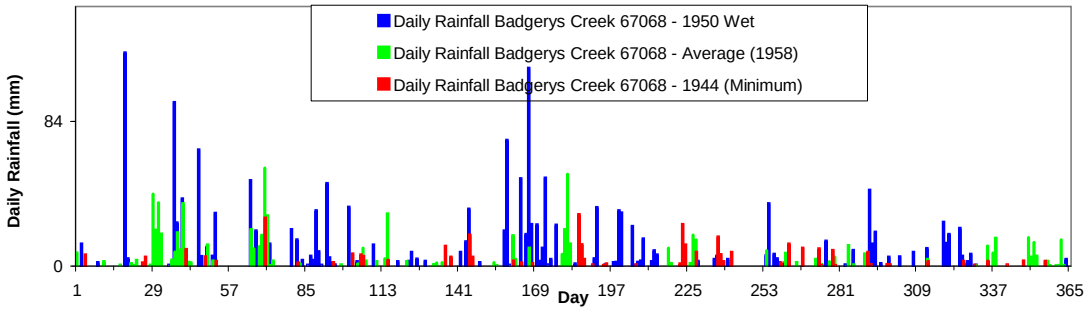




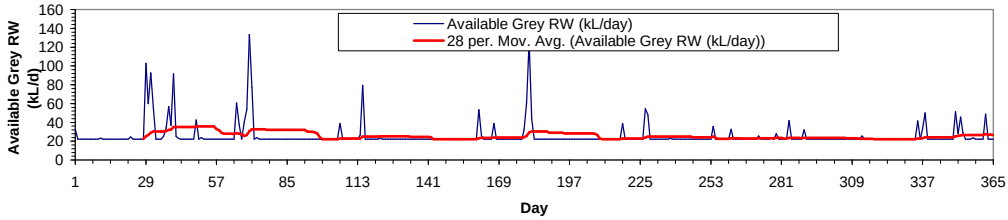


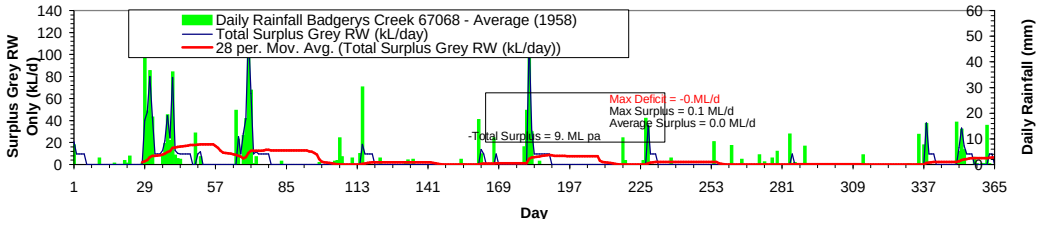
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank

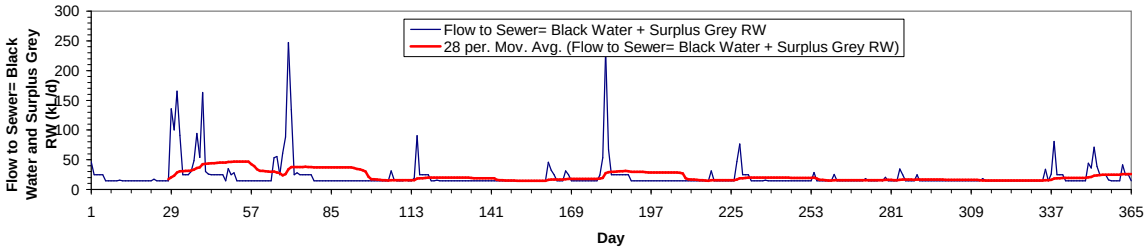


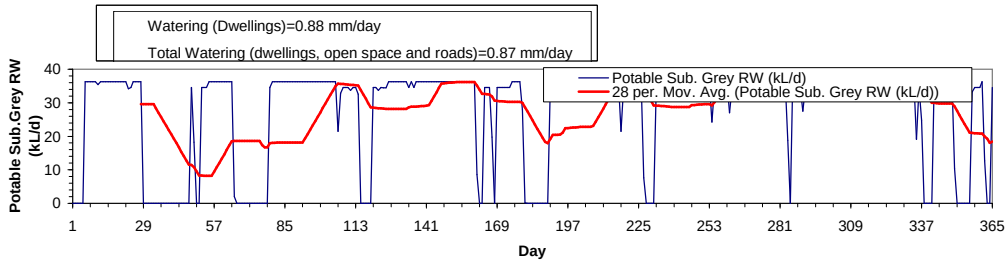


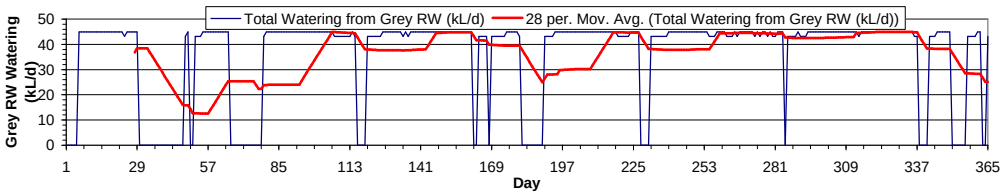
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank - Average Rainfall Year

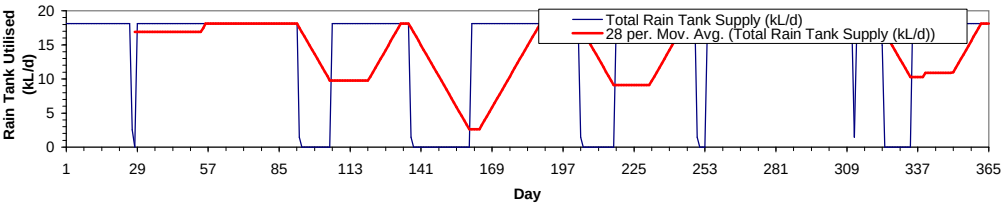


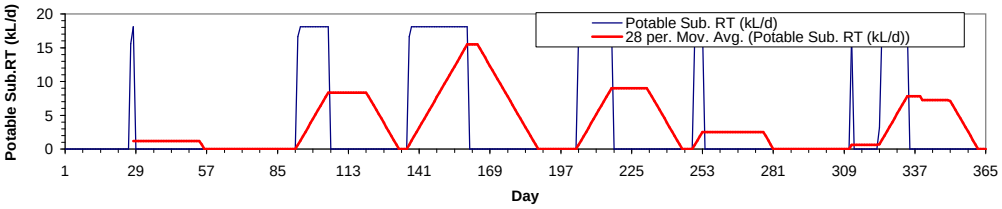




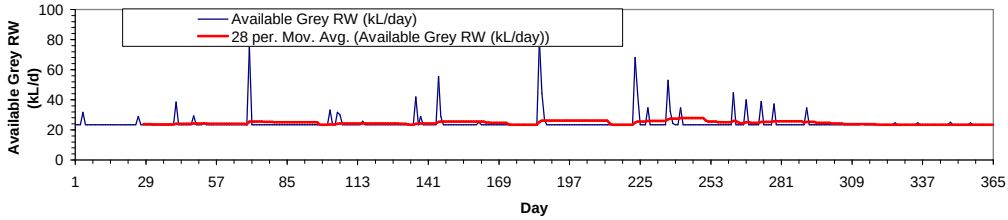


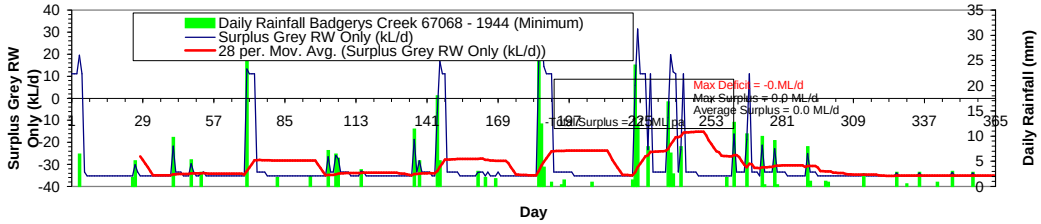


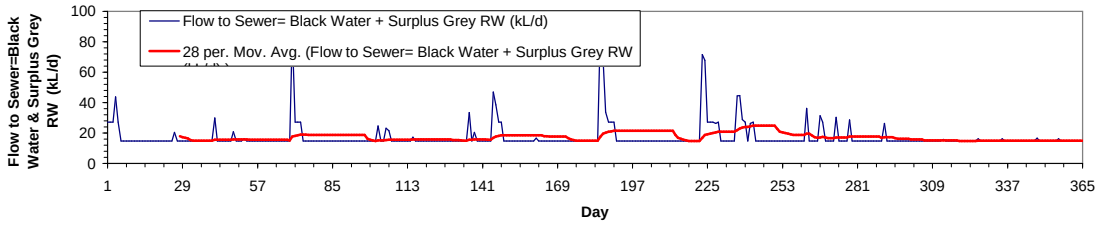


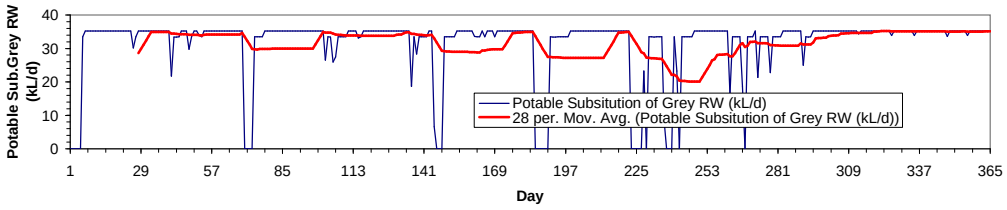


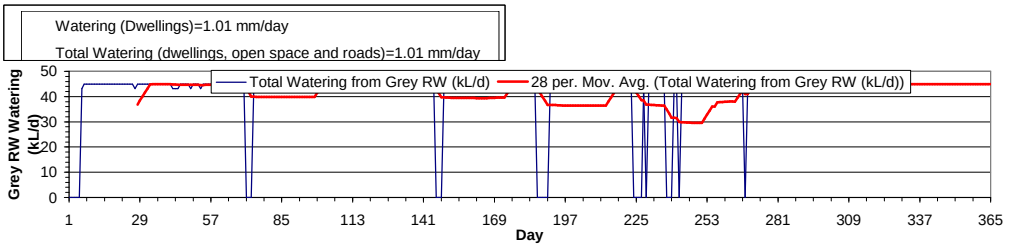
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank - Dry Rainfall Year

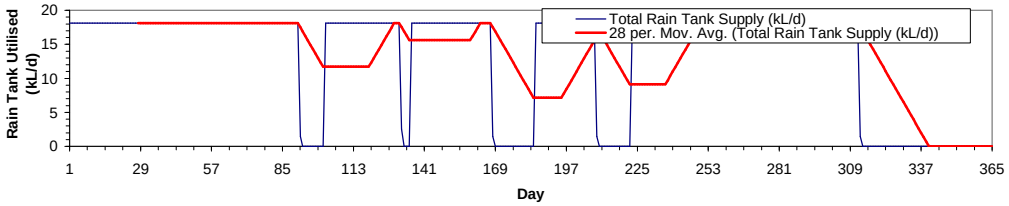


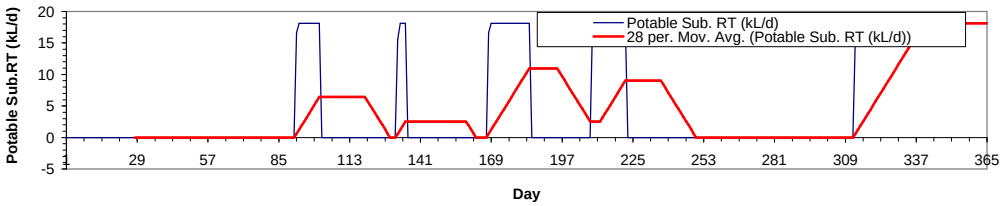




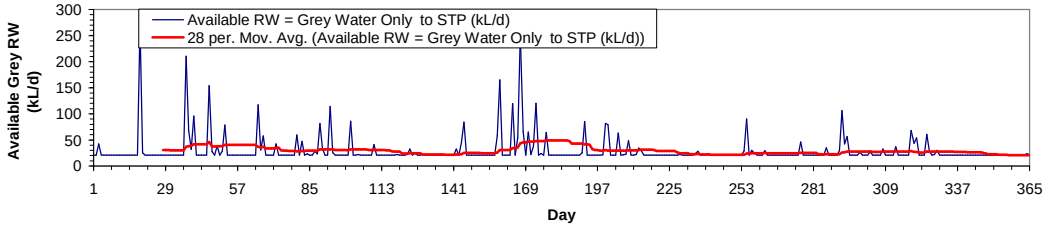


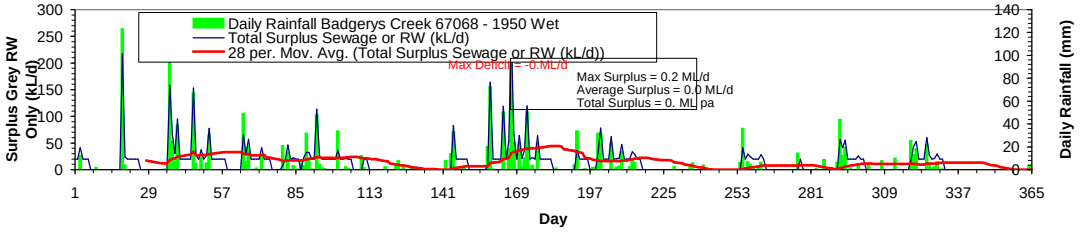


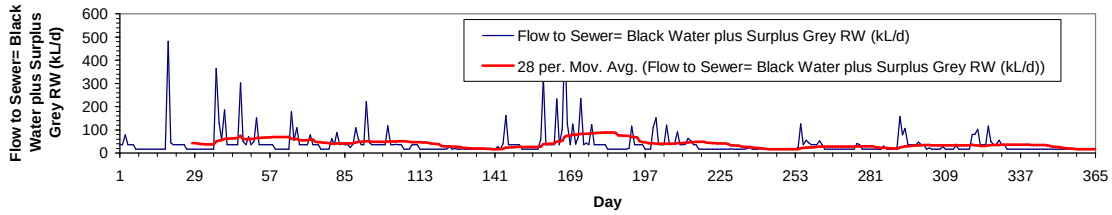


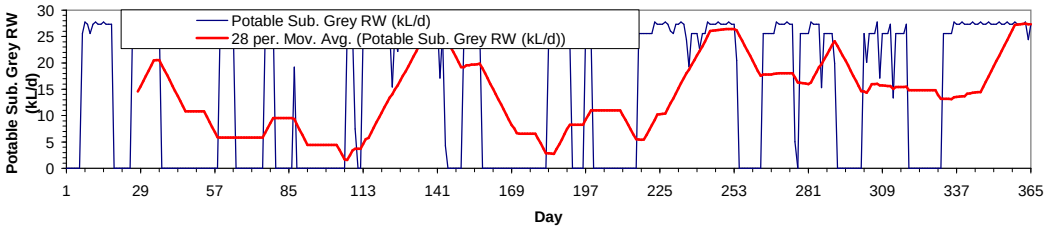


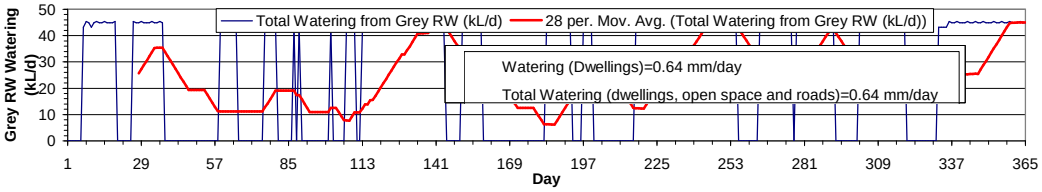
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 20kL tank - Wet Rainfall Year

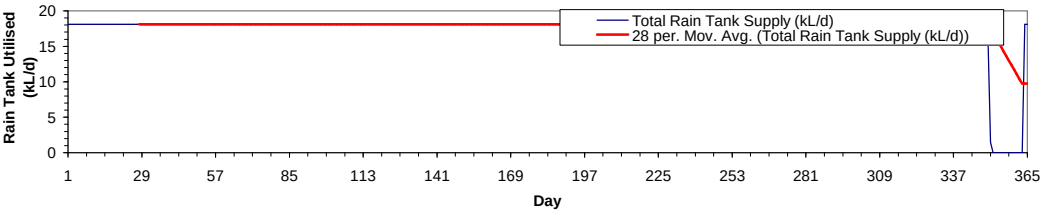


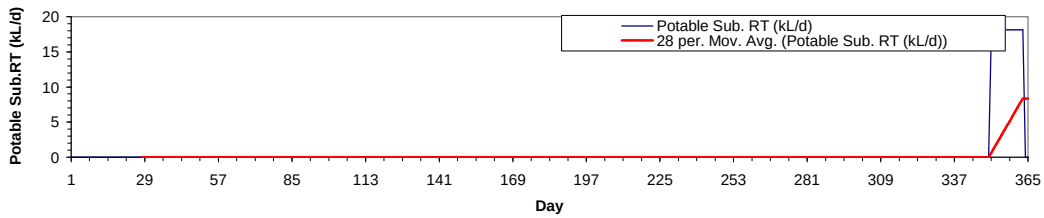




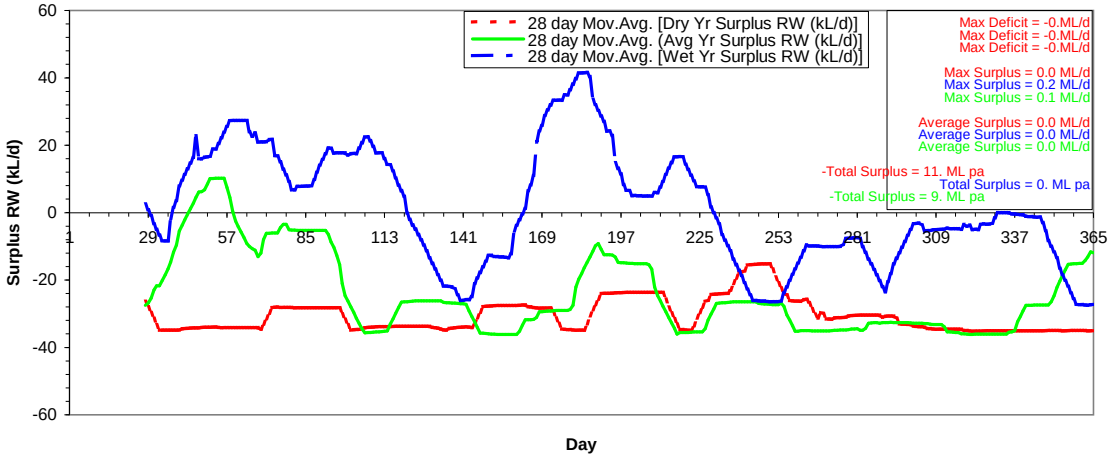


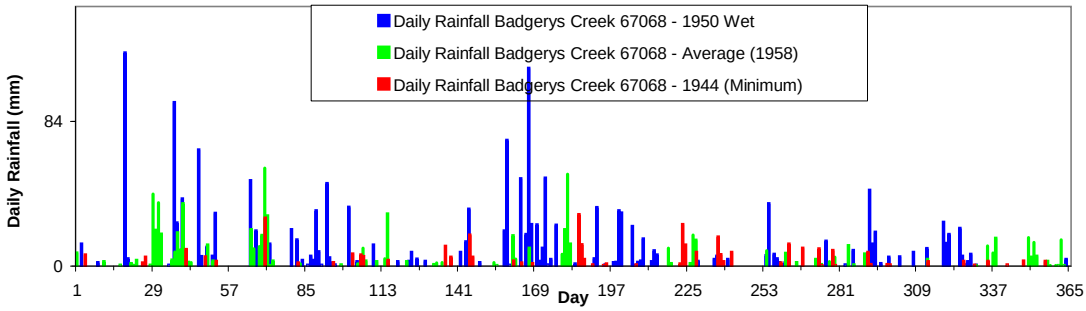




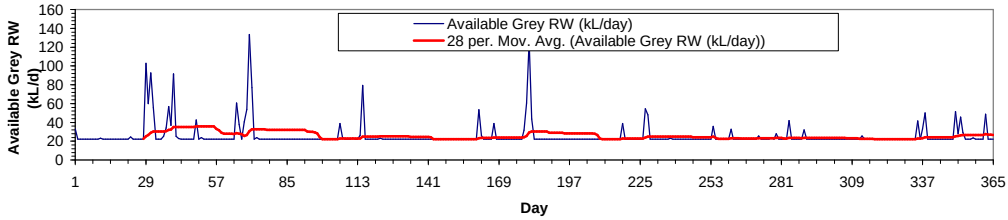


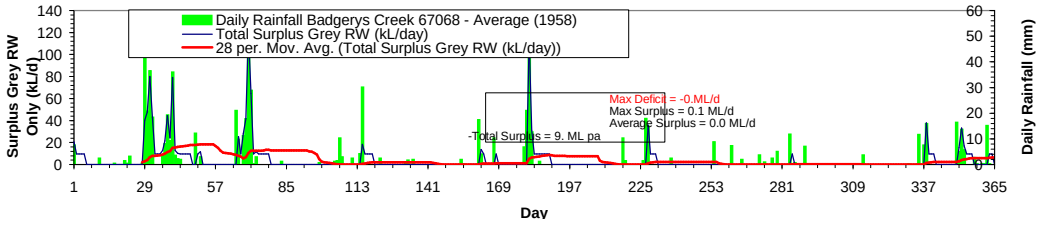
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 25kL tank

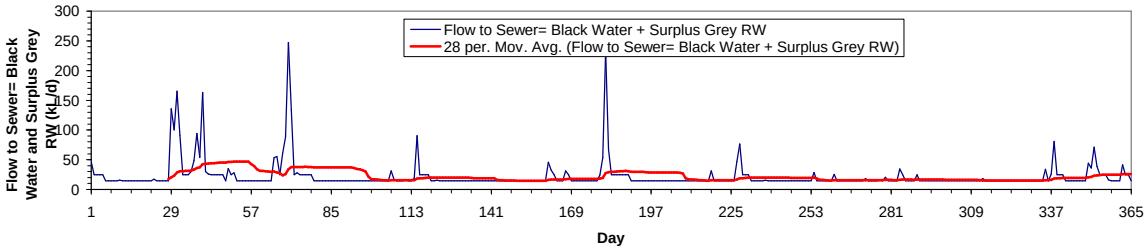


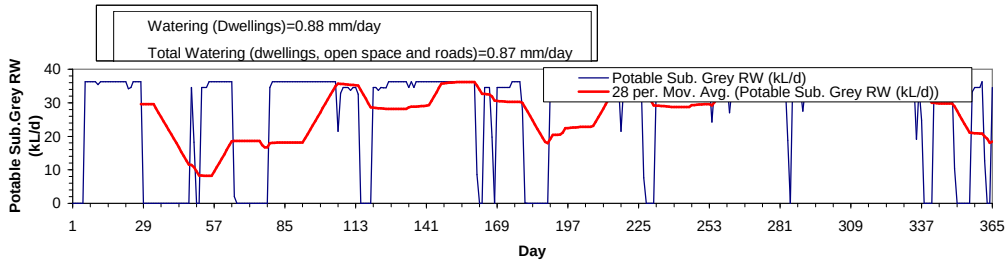


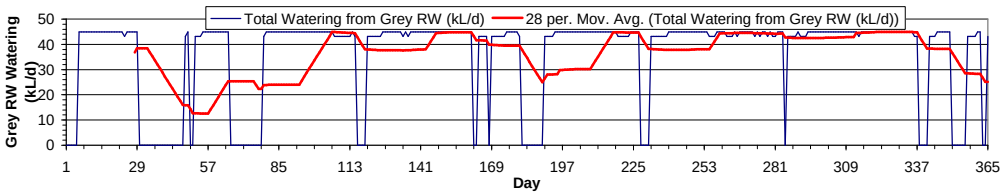
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 25kL tank - Ave Rainfall Year

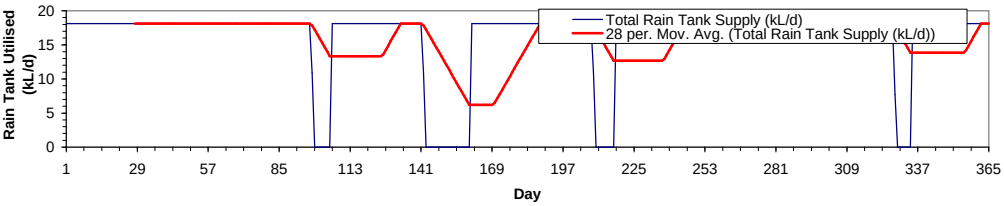


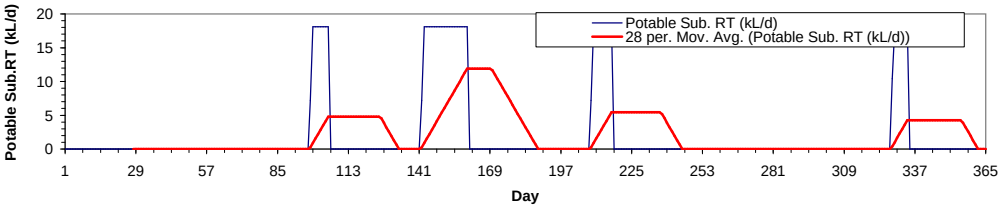




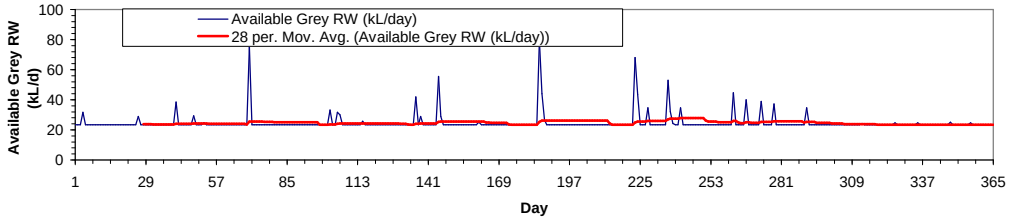


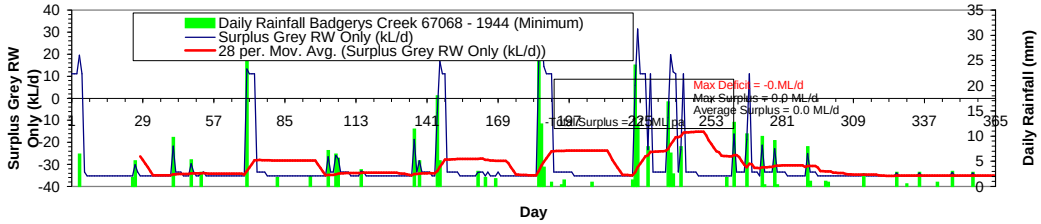


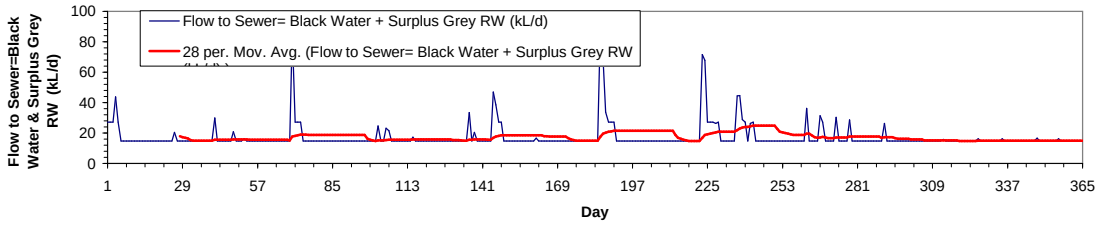


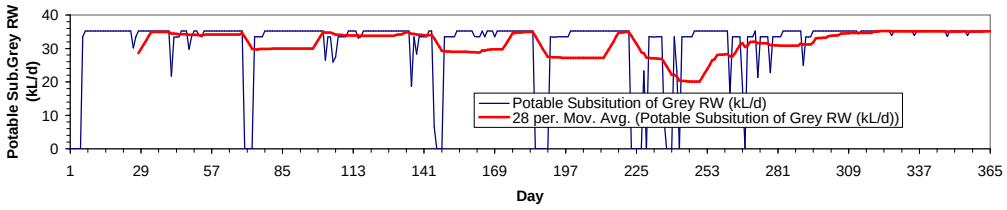


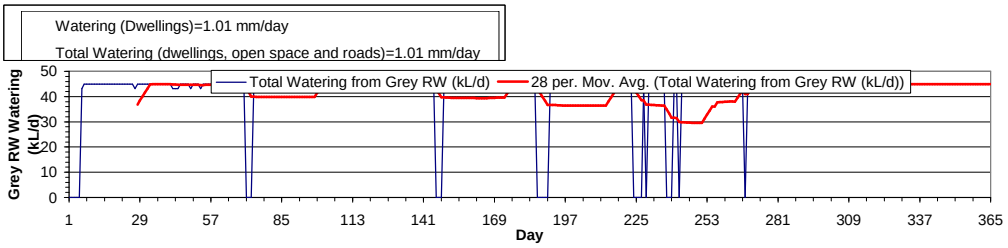
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 25kL tank - Dry Rainfall Year

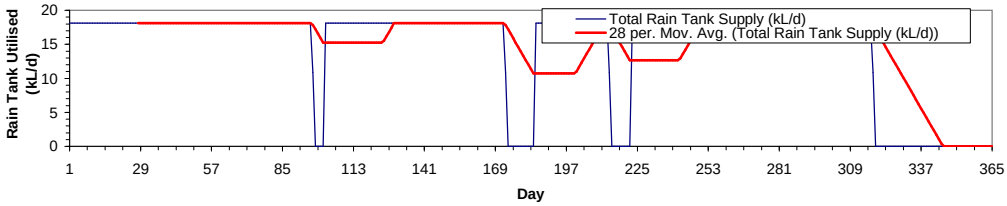


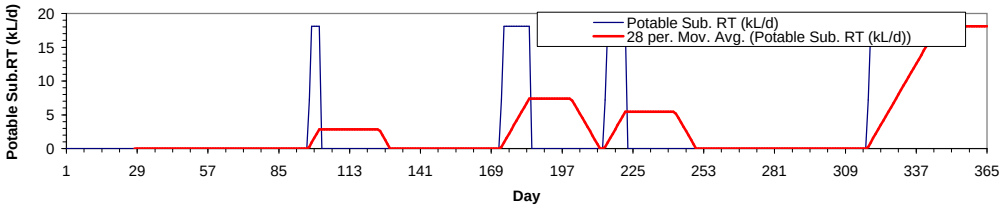




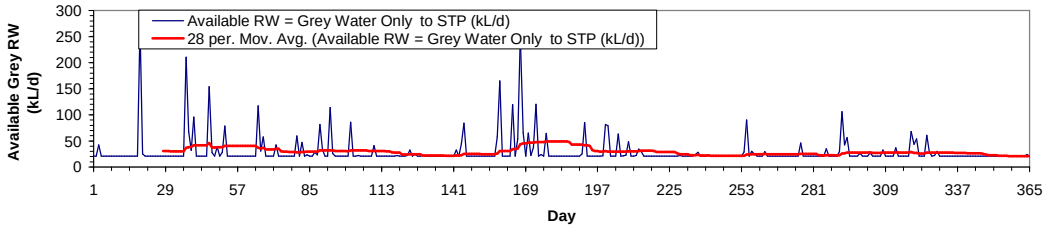


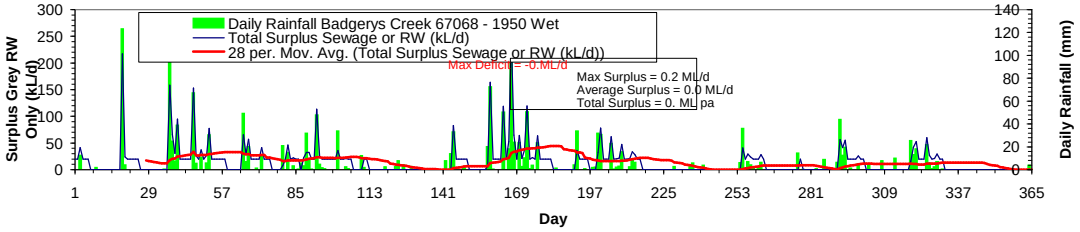


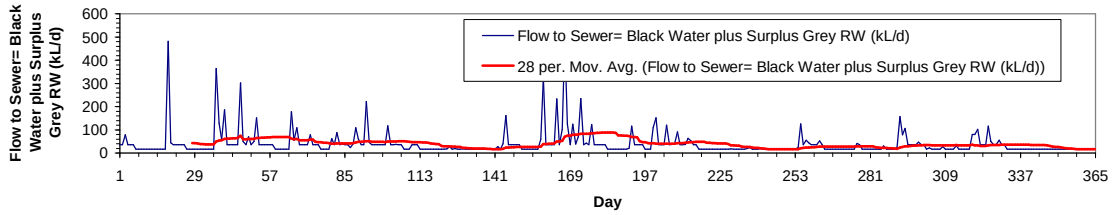


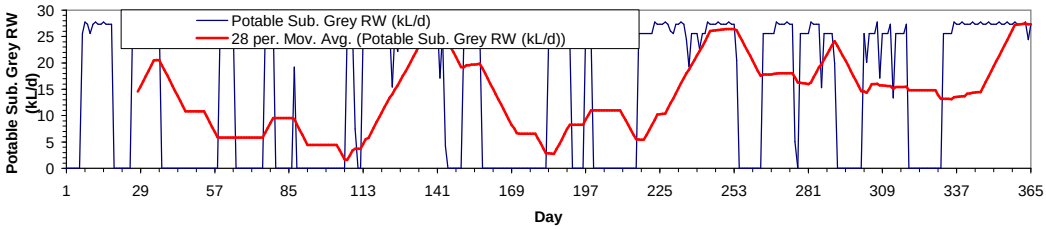


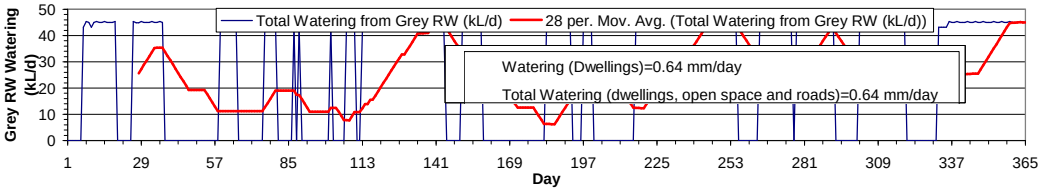
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 25kL tank - Wet Rainfall Year

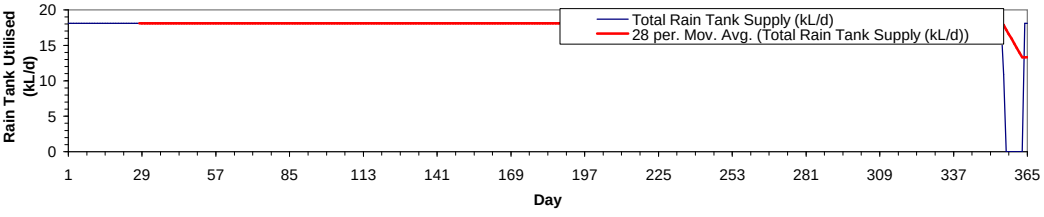


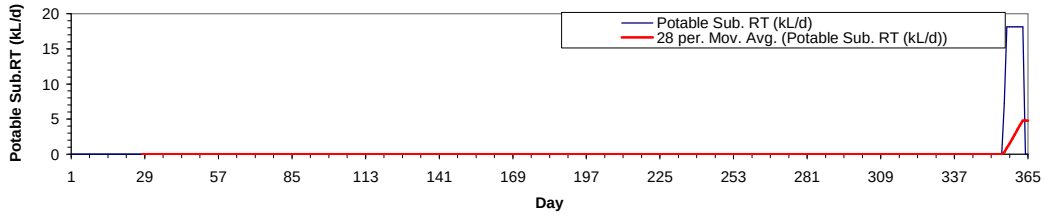




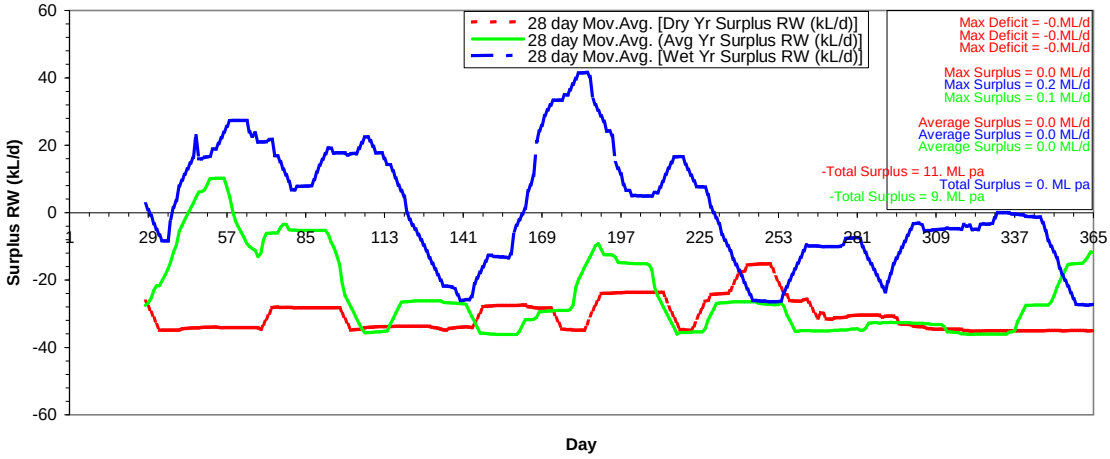


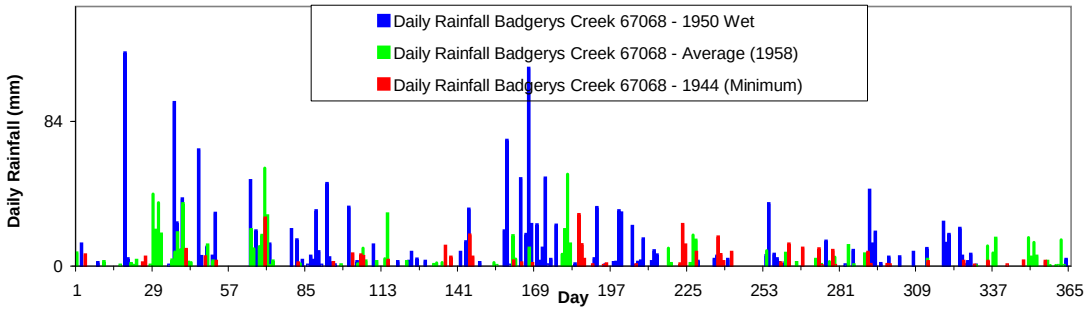




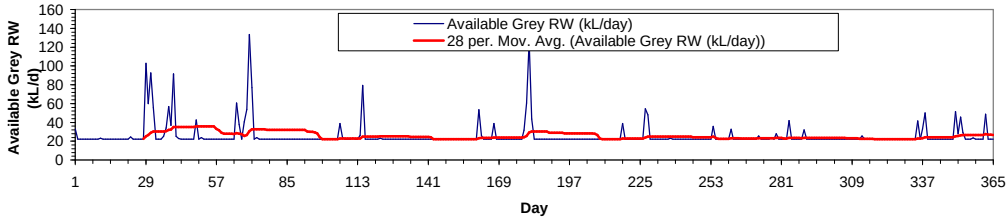


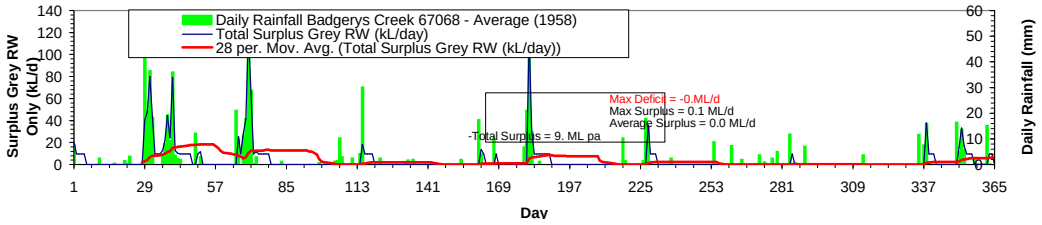
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank

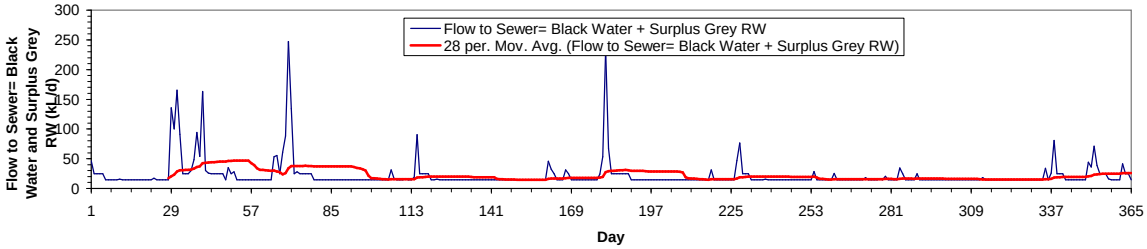


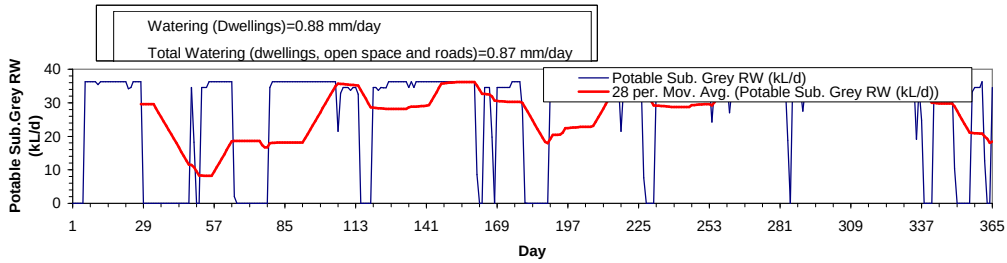


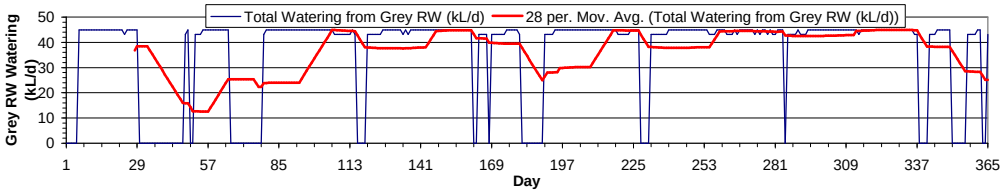
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank - Average Rainfall Year

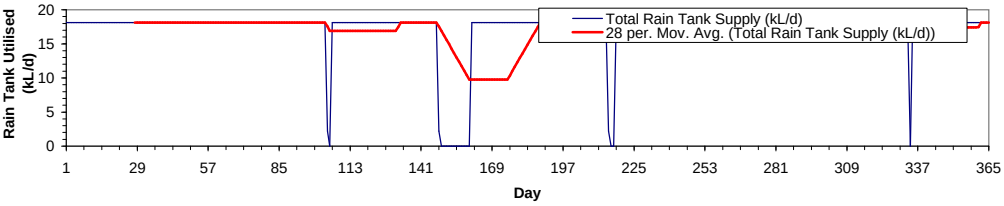


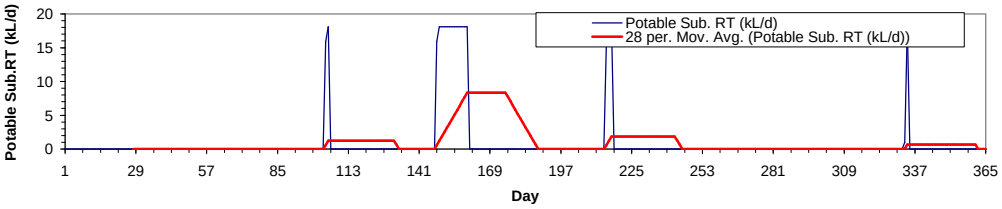




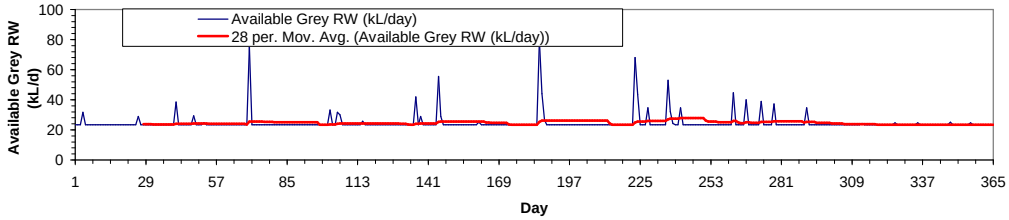


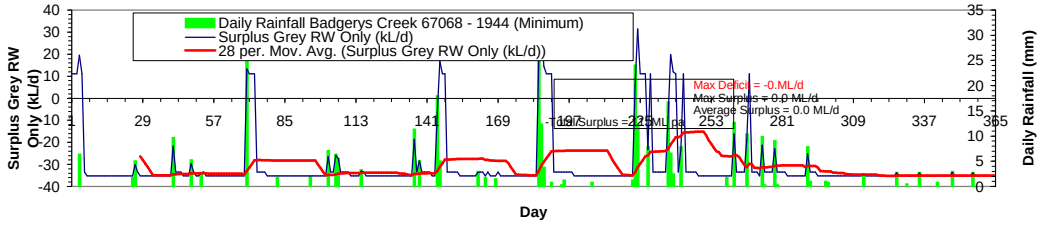


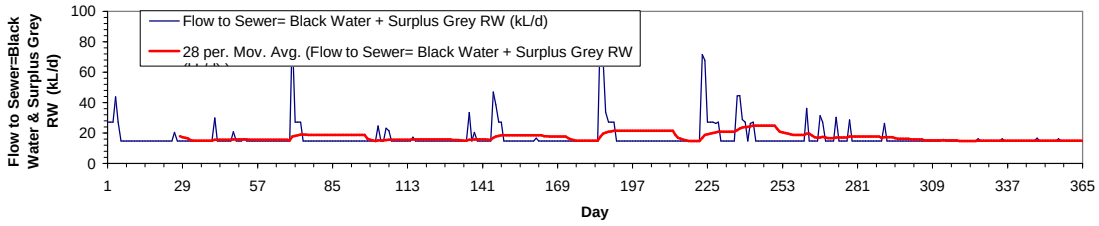


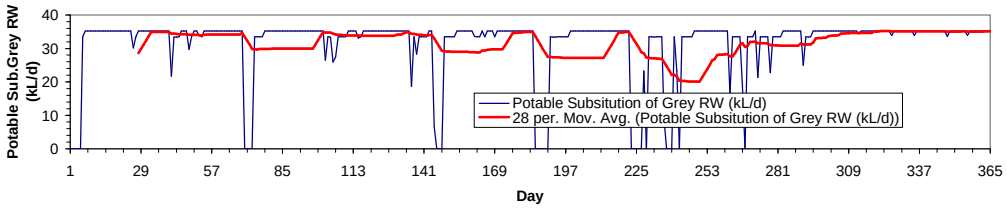


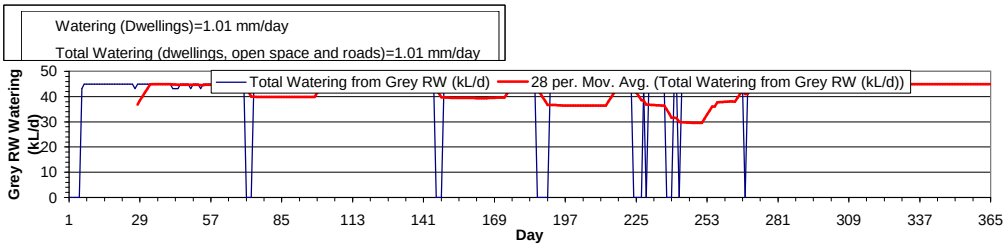
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank - Dry Rainfall Year

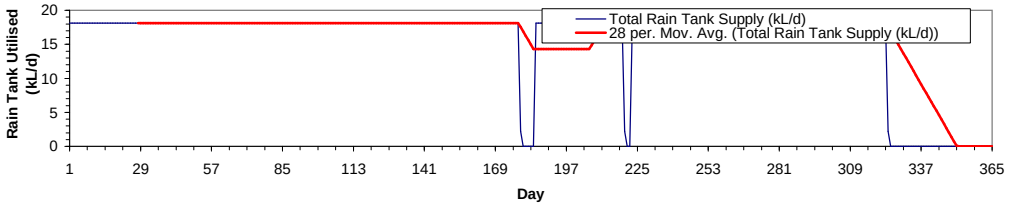


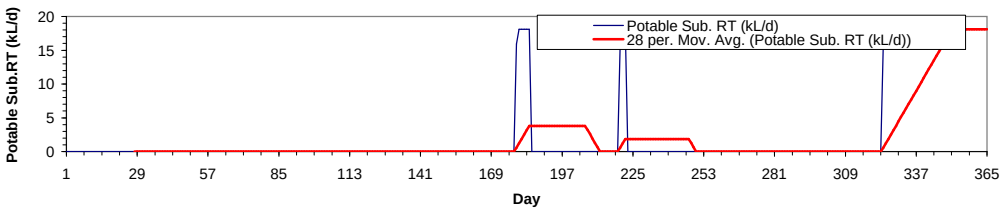




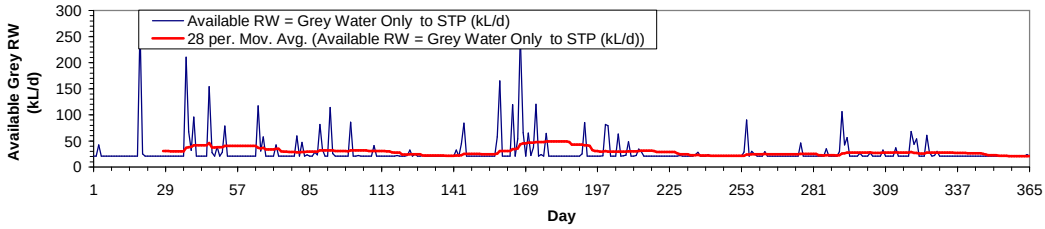


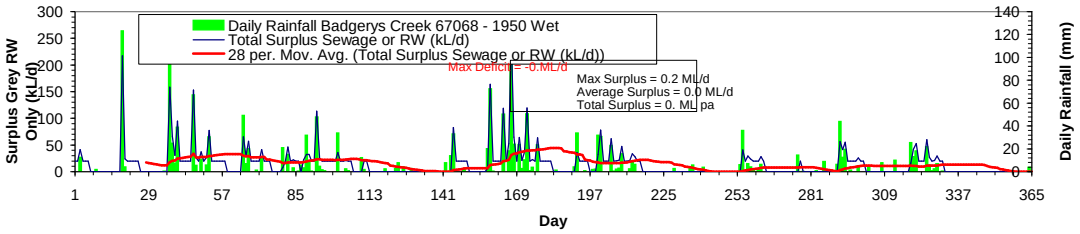


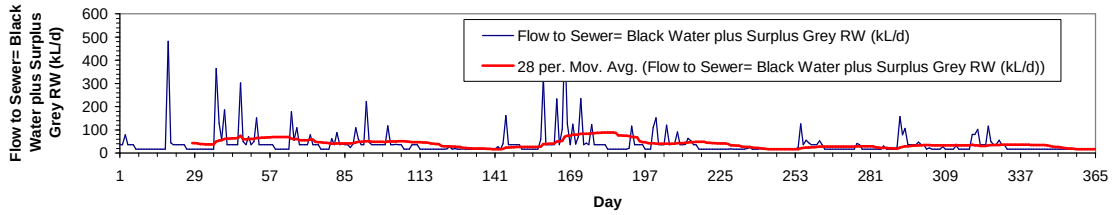


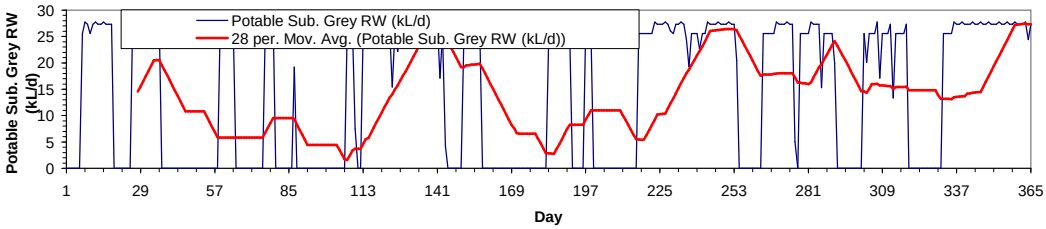


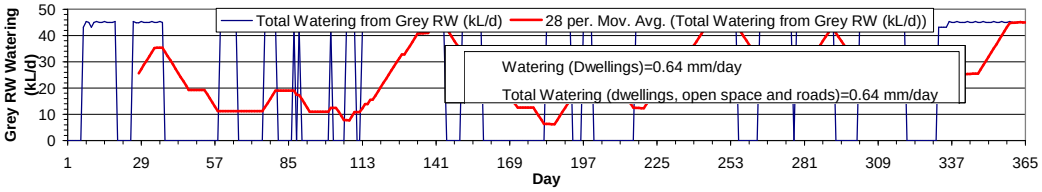
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 30kL tank - Wet Rainfall Year

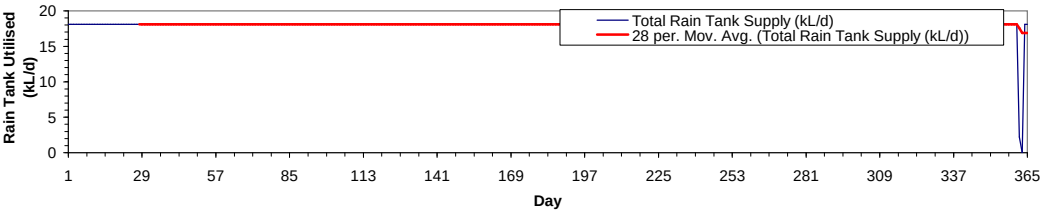


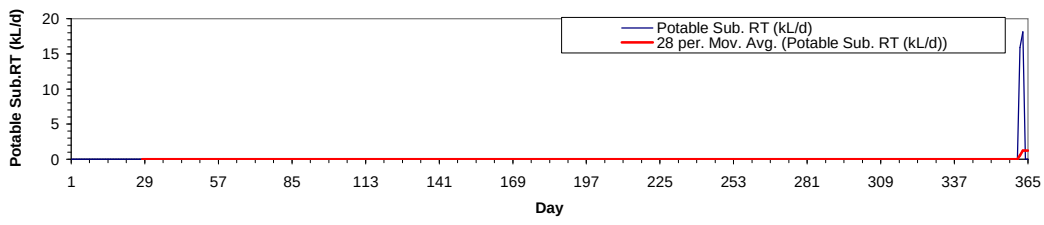




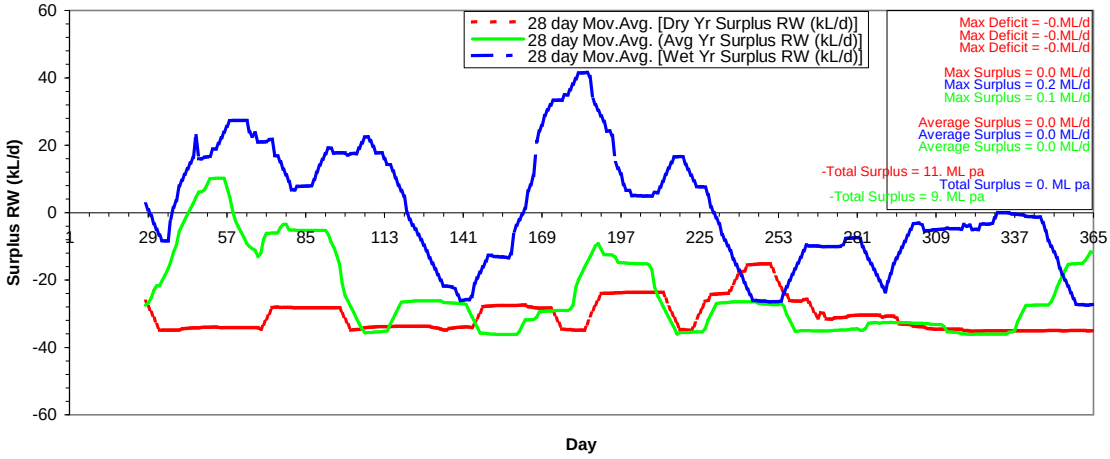


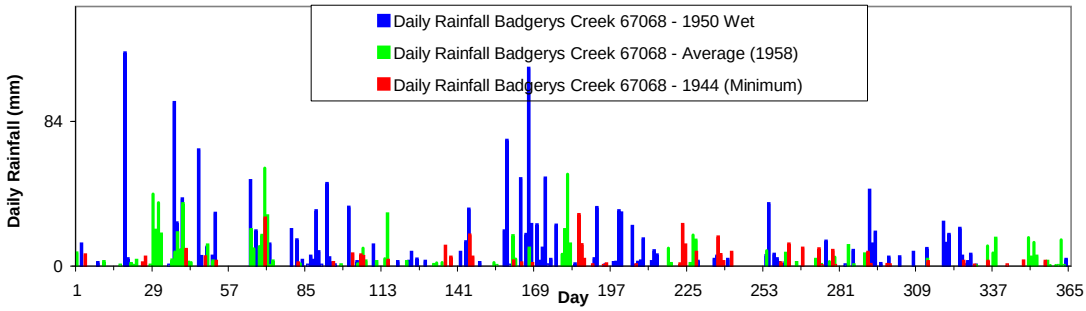




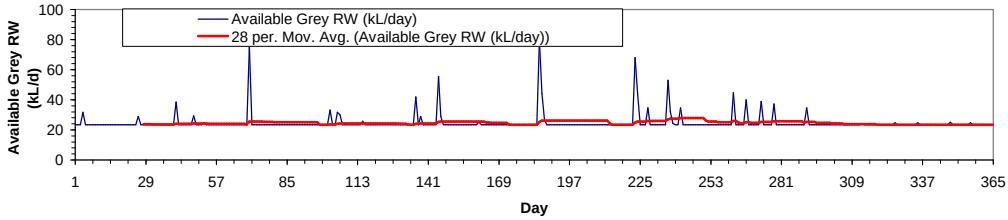


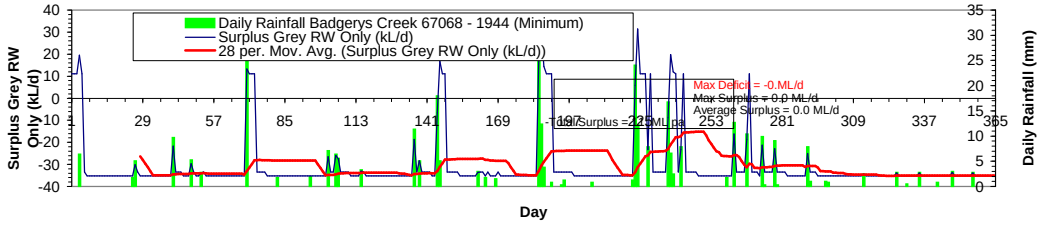
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 35kL tank

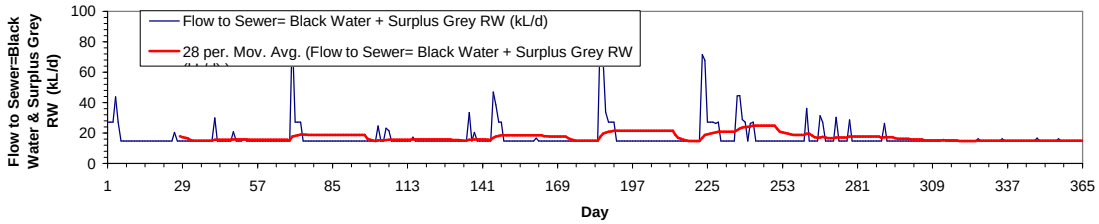


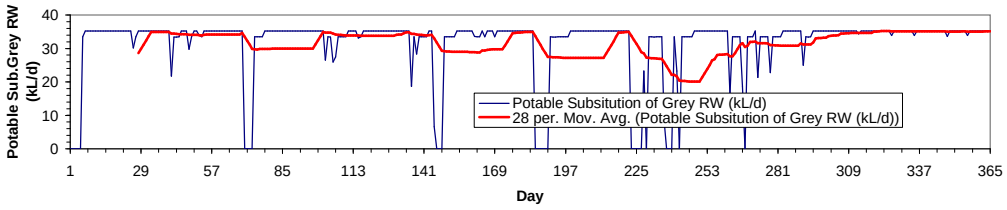


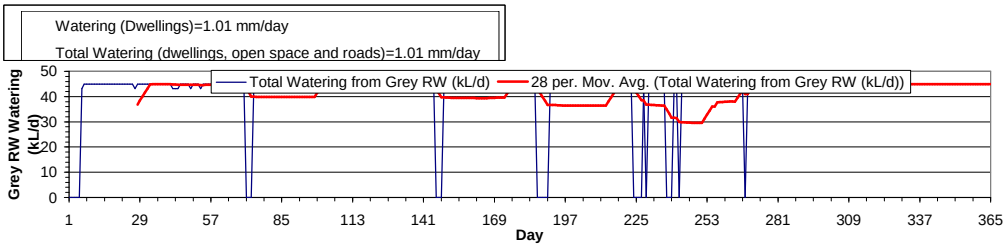
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 35kL tank - Dry Rainfall Year

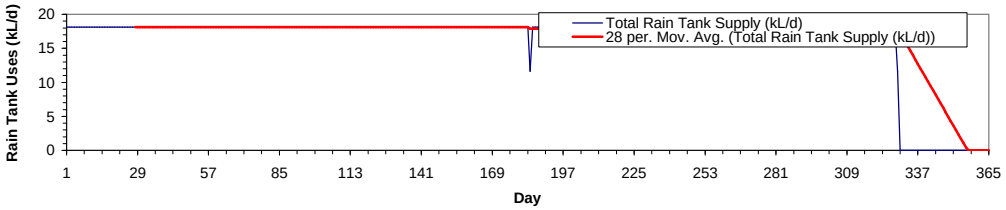


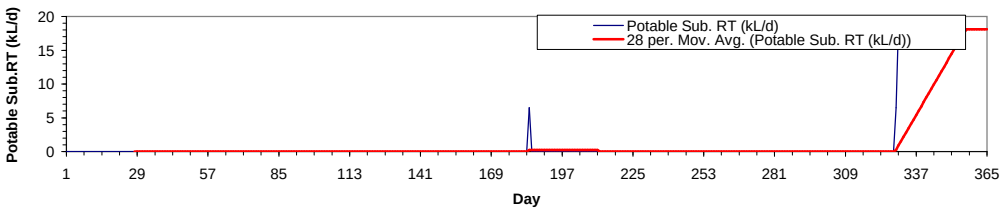




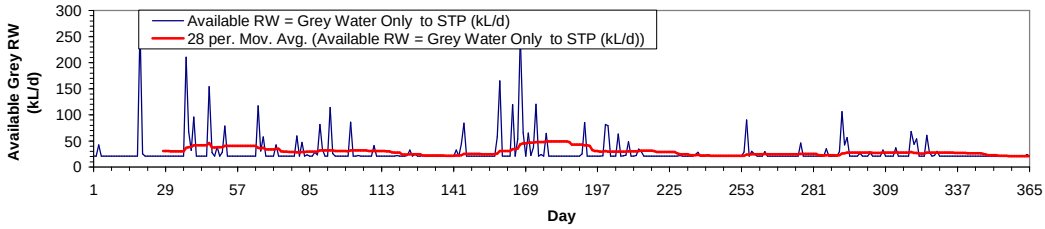


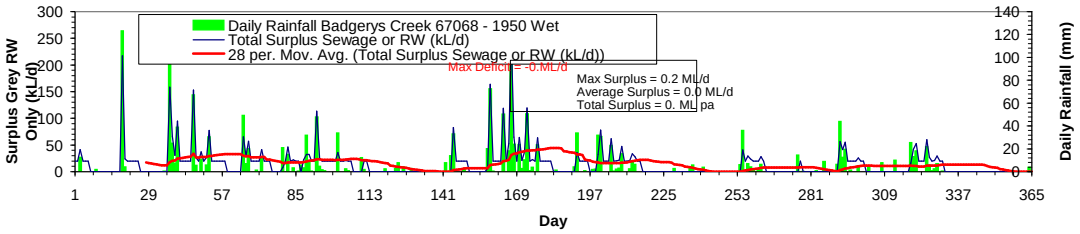


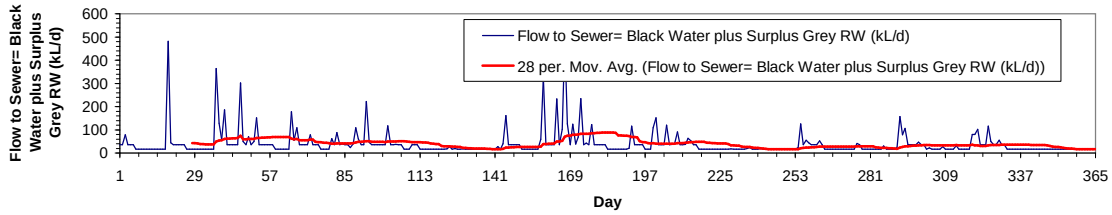


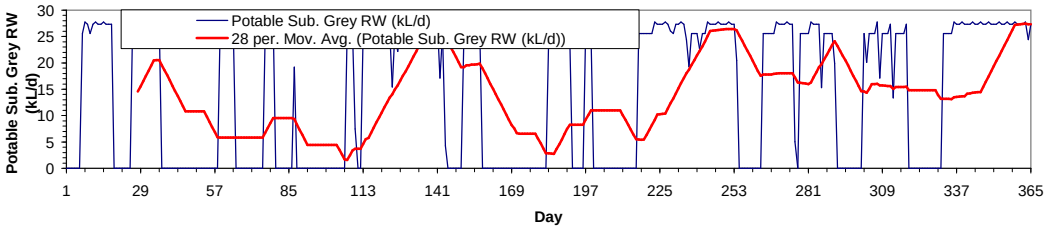


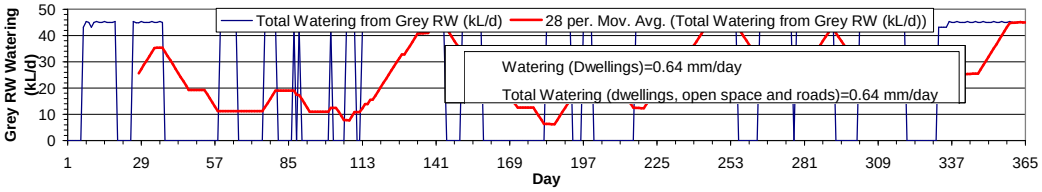
Scenario 6- Stage 1- Rainwater tank to supply toilet and truck wash, 35kL tank - Wet Rainfall Year

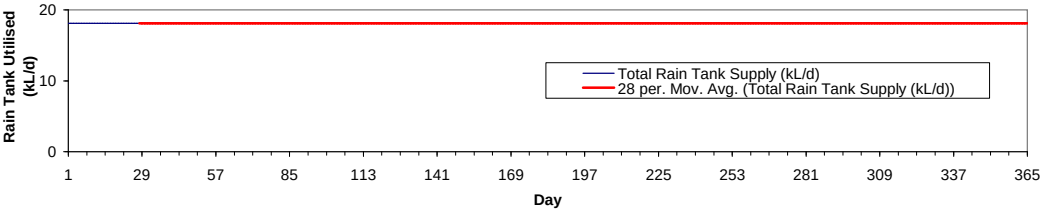


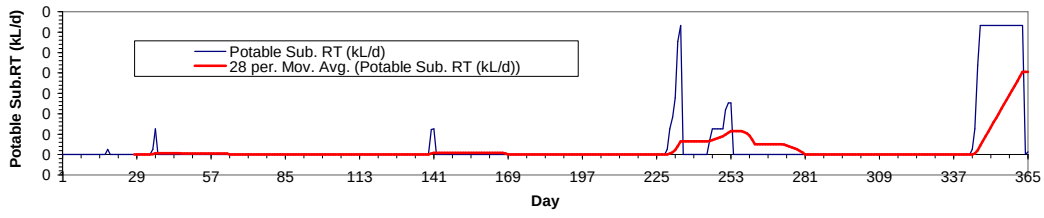












Appendix G

Water Balance – Summary Table Output

Job	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised
Southpipe	SP1_1	Stage 1 - BlackRW Only (Scenario 1)	Average Rainfall	Total (ML/pa)	16.0	2.5	23.7	13.9	11.3	-9.2	11.3	13.1	0.0	0.0	22.2
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	20.2	14.0	7.8	-1.8	7.8	9.6	0.0	0.0	18.9
				Average (ML/day)	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	25.7	14.4	12.9	-12.4	12.9	15.1	0.0	0.0	24.8
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP1_2	Stage 2 - BlackRW Only (Scenario 1)	Average Rainfall	Total (ML/pa)	53.1	8.6	78.2	46.0	37.3	-30.2	37.3	43.1	0.0	0.0	72.9
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.2
				Maximum (ML/day)	0.9	0.8	0.2	0.3	0.1	0.8	0.1	0.1	0.0	0.0	0.2
				Minimum (ML/day)	0.1	0.0	0.1	0.1	0.0	-0.1	0.0	0	0.0	0.0	0.1
			Maximum Rainfall	Total (ML/pa)	66.4	20.5	66.7	46.1	25.6	-5.2	25.6	31.7	0.0	0.0	62.3
				Average (ML/day)	0.2	0.1	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.2
				Maximum (ML/day)	1.8	1.7	0.2	0.3	0.1	1.6	0.1	0.1	0.0	0.0	0.2
				Minimum (ML/day)	0.1	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1
			Minimum Rainfall	Total (ML/pa)	49.1	3.2	84.9	47.4	42.7	-41.0	42.7	49.8	0.0	0.0	81.7
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.2
				Maximum (ML/day)	0.5	0.4	0.2	0.3	0.1	0.2	0.1	0.1	0.0	0.0	0.2
				Minimum (ML/day)	0.1	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1
Southpipe	SP1_3	Stage 3- BlackRW Only (Scenario 1)	Average Rainfall	Total (ML/pa)	87.5	14.8	128.0	75.3	61.0	-48.8	61.0	70.6	0.0	0.0	119.1
				Average (ML/day)	0.2	0.0	0.4	0.2	0.2	-0.1	0.2	0.2	0.0	0.0	0.3
				Maximum (ML/day)	1.5	1.3	0.4	0.4	0.2	1.3	0.2	0.2	0.0	0.0	0.4
				Minimum (ML/day)	0.2	0.0	0.2	0.2	0.0	-0.2	0.0	0	0.0	0.0	0.1
			Maximum Rainfall	Total (ML/pa)	110.3	35.2	109.2	75.5	41.8	-6.9	41.8	51.8	0.0	0.0	101.9
				Average (ML/day)	0.3	0.1	0.3	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.3
				Maximum (ML/day)	3.1	2.9	0.4	0.4	0.2	2.7	0.2	0.2	0.0	0.0	0.4
				Minimum (ML/day)	0.2	0.0	0.2	0.2	0.0	-0.2	0.0	0.0	0.0	0.0	0.1
			Minimum Rainfall	Total (ML/pa)	80.6	5.5	138.9	77.7	69.8	-66.8	69.8	81.5	0.0	0.0	133.6
				Average (ML/day)	0.2	0.0	0.4	0.2	0.2	-0.2	0.2	0.2	0.0	0.0	0.4
				Maximum (ML/day)	0.9	0.7	0.4	0.4	0.2	0.4	0.2	0.2	0.0	0.0	0.4
				Minimum (ML/day)	0.2	0.0	0.2	0.2	0.0	-0.2	0.0	0.0	0.0	0.0	0.1
Southpipe	SP1_4	Stage 4 - BlackRW Only (Scenario 1)	Average Rainfall	Total (ML/pa)	131.3	42.4	156.4	93.6	73.2	-35.5	73.2	86.3	0.0	0.0	144.7
				Average (ML/day)	0.4	0.1	0.4	0.3	0.2	-0.1	0.2	0.2	0.0	0.0	0.4
				Maximum (ML/day)	4.0	3.7	0.5	0.5	0.3	3.7	0.3	0.3	0.0	0.0	0.5
				Minimum (ML/day)	0.2	0.0	0.2	0.2	0.0	-0.3	0.0	0	0.0	0.0	0.2
			Maximum Rainfall	Total (ML/pa)	192.7	100.9	133.5	93.9	49.5	49.3	49.5	63.3	0.0	0.0	122.9
				Average (ML/day)	0.5	0.3	0.4	0.3	0.1	0.1	0.1	0.2	0.0	0.0	0.3
				Maximum (ML/day)	8.5	8.3	0.5	0.5	0.3	8.0	0.3	0.3	0.0	0.0	0.5
				Minimum (ML/day)	0.3	0.0	0.2	0.2	0.0	-0.3	0.0	0.0	0.0	0.0	0.2
			Minimum Rainfall	Total (ML/pa)	107.6	15.8	169.8	96.7	83.7	-72.7	83.7	99.7	0.0	0.0	161.6
				Average (ML/day)	0.3	0.0	0.5	0.3	0.2	-0.2	0.2	0.3	0.0	0.0	0.4
				Maximum (ML/day)	2.1	1.9	0.5	0.5	0.3	1.6	0.3	0.3	0.0	0.0	0.5
				Minimum (ML/day)	0.3	0.0	0.2	0.2	0.0	-0.3	0.0	0.0	0.0	0.0	0.2

Job	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer (grey water not utiilised and black water)	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Flow to Grey Water Recycling Plant	Flow to Grey water Recycling not utilised (excess)	Black water only flow to sewer
Southpipe	SP2_1	Stage 1- Grey Water Recycling (Scenario 2)	Average Rainfall	Total (ML/pa)	7.2	2.5	23.7	8.8	15.9	-15.3	15.9	13.1	0.0	0.0	27.2	9.3	0.5	6.7
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	11.1	6.0	16.6	8.4	9.1	-6.9	9.1	9.6	0.0	0.0	20.2	10.7	2.2	8.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	5.9	0.9	25.7	9.0	17.8	-17.7	17.8	15.1	0.0	0.0	29.6	9.0	0.0	5.9
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP2_2	Stage 2- Grey Water Recycling (Scenario 2)	Average Rainfall	Total (ML/pa)	24.0	8.6	78.2	29.1	52.4	-50.5	52.4	43.1	0.0	0.0	89.7	31.0	1.9	22.1
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.1
				Maximum (ML/day)	0.8	0.8	0.2	0.3	0.2	0.3	0.2	0.1	0.0	0.0	0.3	0.5	0.3	0.4
				Minimum (ML/day)	0.0	0.0	0.1	0.1	0.0	-0.2	0.0	0	0.0	0.0	0.1	0.1	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	37.1	20.5	54.7	27.9	29.9	-22.4	30.0	31.7	0.0	0.0	66.7	35.5	7.6	29.5
				Average (ML/day)	0.1	0.1	0.1	0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.1
				Maximum (ML/day)	1.6	1.7	0.2	0.2	0.2	0.8	0.2	0.1	0.0	0.0	0.3	0.9	0.8	0.9
				Minimum (ML/day)	0.1	0.0	0.1	0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
			Minimum Rainfall	Total (ML/pa)	19.6	3.2	84.9	29.6	58.6	-58.5	58.6	49.8	0.0	0.0	97.6	29.7	0.2	19.4
				Average (ML/day)	0.1	0.0	0.2	0.1	0.2	-0.2	0.2	0.1	0.0	0.0	0.3	0.1	0.0	0.1
				Maximum (ML/day)	0.3	0.4	0.2	0.3	0.2	0.0	0.2	0.1	0.0	0.0	0.3	0.3	0.1	0.2
				Minimum (ML/day)	0.0	0.0	0.1	0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Southpipe	SP2_3	Stage 3- Grey Water Recycling (Scenario 2)	Average Rainfall	Total (ML/pa)	39.9	14.8	128.0	47.7	85.6	-82.3	85.6	70.6	0.0	0.0	146.7	51.0	3.3	36.5
				Average (ML/day)	0.1	0.0	0.4	0.1	0.2	-0.2	0.2	0.2	0.0	0.0	0.4	0.1	0.0	0.1
				Maximum (ML/day)	1.3	1.3	0.4	0.4	0.3	0.6	0.3	0.2	0.0	0.0	0.5	0.8	0.6	0.7
				Minimum (ML/day)	0.1	0.0	0.2	0.1	0.0	-0.3	0.0	0	0.0	0.0	0.1	0.1	0.0	0.1
			Maximum Rainfall	Total (ML/pa)	62.3	35.2	89.6	45.7	48.9	-35.8	49.0	51.9	0.0	0.0	109.1	58.8	13.2	49.1
				Average (ML/day)	0.2	0.1	0.2	0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.1
				Maximum (ML/day)	2.8	2.9	0.3	0.4	0.2	1.3	0.2	0.2	0.0	0.0	0.4	1.6	1.3	1.5
				Minimum (ML/day)	0.1	0.0	0.1	0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
			Minimum Rainfall	Total (ML/pa)	32.2	5.5	138.9	48.6	95.7	-95.6	95.7	81.5	0.0	0.0	159.5	48.7	0.3	31.9
				Average (ML/day)	0.1	0.0	0.4	0.1	0.3	-0.3	0.3	0.2	0.0	0.0	0.4	0.1	0.0	0.1
				Maximum (ML/day)	0.5	0.7	0.4	0.4	0.3	0.1	0.3	0.2	0.0	0.0	0.5	0.5	0.1	0.4
				Minimum (ML/day)	0.1	0.0	0.2	0.1	0.0	-0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
Southpipe	SP2_4	Stage 1- Grey Water Recycling (Scenario 4)	Average Rainfall	Total (ML/pa)	70.0	42.4	156.4	61.3	101.9	-88.7	101.9	86.3	0.0	0.0	176.3	74.5	13.2	56.8
				Average (ML/day)	0.2	0.1	0.4	0.2	0.3	-0.2	0.3	0.2	0.0	0.0	0.5	0.2	0.0	0.2
				Maximum (ML/day)	3.7	3.7	0.5	0.5	0.4	1.8	0.4	0.3	0.0	0.0	0.6	2.0	1.8	2.0
				Minimum (ML/day)	0.1	0.0	0.2	0.1	0.0	-0.4	0.0	0	0.0	0.0	0.2	0.1	0.0	0.1
			Maximum Rainfall	Total (ML/pa)	132.2	100.9	109.5	57.6	58.1	-15.1	58.3	63.4	0.0	0.0	131.7	100.8	43.2	89.0
				Average (ML/day)	0.4	0.3	0.3	0.2	0.2	0.0	0.2	0.2	0.0	0.0	0.4	0.3	0.1	0.2
				Maximum (ML/day)	8.1	8.3	0.4	0.5	0.3	3.8	0.3	0.3	0.0	0.0	0.5	4.3	3.8	4.2
				Minimum (ML/day)	0.1	0.0	0.1	0.1	0.0	-0.3	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1
			Minimum Rainfall	Total (ML/pa)	46.4	15.8	169.8	61.7	114.9	-112.5	114.9	99.7	0.0	0.0	192.9	64.1	2.8	43.5
				Average (ML/day)	0.1	0.0	0.5	0.2	0.3	-0.3	0.3	0.3	0.0	0.0	0.5	0.2	0.0	0.1
				Maximum (ML/day)	1.6	1.9	0.5	0.5	0.4	0.5	0.4	0.3	0.0	0.0	0.6	1.1	0.6	1.0
				Minimum (ML/day)	0.1	0.0	0.2	0.2	0.0	-0.4	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.1

Job	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	
Southpipe	SP3_1_1_20kL	Stage 1 - BlackRW (for all permissable except toilets). Rainwate to supply toilets. 20kL tank for each dwelling, Collecting rainwater in access of 44mm.	Average Rainfall	Total (ML/pa)	16.0	2.5	19.4	12.9	8.0	-4.8	8.0	13.1	1.0	3.3	21.8	4.3	
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	15.9	11.8	5.4	2.7	5.4	9.6	2.0	2.2	18.8	4.3	
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	21.5	13.9	9.0	-8.1	9.0	15.1	0.2	4.1	24.9	4.3	
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Southpipe	SP3_1_1_30kL	Stage 1 - BlackRW (for all permissable except toilets). Rainwate to supply toilets. 30kL tank for each dwelling, Collecting rainwater in access of 44mm.	Average Rainfall	Total (ML/pa)	16.0	2.5	19.4	12.9	8.0	-4.8	8.0	13.1	1.5	2.8	21.3	4.3	
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	15.9	11.8	5.4	2.7	5.4	9.6	2.4	1.8	18.3	4.3	
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	21.5	13.9	9.0	-8.1	9.0	15.1	0.3	4.0	24.8	4.3	
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Overflow to Stormwater
Southpipe	SP4_1_1_15kL	Stage 1 - BlackRW (for all permissable except toilets). Rainwater to supply toilets. 15kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	16.0	2.5	19.4	12.9	8.0	-4.8	8.0	13.1	3.8	0.5	19.0	4.3	138.1
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	15.9	11.8	5.4	2.7	5.4	9.6	4.2	0.1	16.6	4.3	342.0
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.3
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	21.5	13.9	9.0	-8.1	9.0	15.1	3.3	0.9	21.8	4.3	47.4
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	6.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP4_1_1_20kL	Stage 1 - BlackRW (for all permissable except toilets). Rainwater to supply toilets. 20kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	16.0	2.5	19.4	12.9	8.0	-4.8	8.0	13.1	4.1	0.2	18.7	4.3	137.7
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	15.9	11.8	5.4	2.7	5.4	9.6	4.3	0.0	16.5	4.3	342.0
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.3
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	21.5	13.9	9.0	-8.1	9.0	15.1	3.7	0.6	21.4	4.3	47.1
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	6.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP4_1_2TC_20kL	Stage 1 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 20kL tank for each dwelling, Collecting all rainwater - except	Average Rainfall	Total (ML/pa)	16.0	2.5	17.1	12.2	6.2	-2.4	6.2	13.1	5.4	1.2	17.8	6.6	136.4
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	13.6	10.7	4.1	5.2	4.1	9.6	6.4	0.2	15.5	6.6	339.9
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	19.1	13.7	6.9	-5.8	6.9	15.1	4.8	1.8	20.5	6.6	46.0
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	6.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP4_1_2TC_25kL	Stage 1 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 25kL tank for each dwelling, Collecting all rainwater - except	Average Rainfall	Total (ML/pa)	16.0	2.5	17.1	12.2	6.2	-2.4	6.2	13.1	5.9	0.7	17.3	6.6	135.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	13.6	10.7	4.1	5.2	4.1	9.6	6.5	0.1	15.4	6.6	339.8
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	19.1	13.7	6.9	-5.8	6.9	15.1	5.3	1.3	20.1	6.6	45.6
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	6.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP4_1_2TC_30kL	Stage 1 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 30kL tank for each dwelling, Collecting all rainwater - except	Average Rainfall	Total (ML/pa)	16.0	2.5	17.1	12.2	6.2	-2.4	6.2	13.1	6.3	0.3	16.9	6.6	135.4
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	13.6	10.7	4.1	5.2	4.1	9.6	6.6	0.0	15.3	6.6	339.8
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	19.1	13.7	6.9	-5.8	6.9	15.1	5.7	0.9	19.7	6.6	45.2
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	5.9
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Job	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	
Southpipe	SP4_1_3TCA_25kL	Stage 1 - BlackRW (for all permissable except toilets , car wash and air conditioning cooling). Rainwater to supply toilets, car washing and air conditioning cooling. 25kL tank	Average Rainfall	Total (ML/pa)	16.0	2.5	13.4	11.3	3.4	1.3	3.4	13.1	7.5	2.8	16.3	10.3	134.3
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	19.5	6.0	10.0	8.6	2.3	8.6	2.3	9.6	9.7	0.6	14.0	10.3	336.7
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.4	0.9	15.5	12.8	4.0	-2.5	4.0	15.1	6.5	3.7	19.6	10.3	44.3
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	6.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP4_1_3TCA_30kL	Stage 1 - BlackRW (for all permissable except toilets , car wash and air conditioning cooling). Rainwater to supply toilets, car washing and air conditioning cooling. 30kL tank	Average Rainfall	Total (ML/pa)	16.0	2.5	13.4	11.3	3.4	1.3	3.4	13.1	8.1	2.2	15.7	10.3	133.7
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	19.5	6.0	10.0	8.6	2.3	8.6	2.3	9.6	9.9	0.4	13.9	10.3	336.5
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.4	0.9	15.5	12.8	4.0	-2.5	4.0	15.1	7.3	2.9	18.8	10.3	43.6
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	5.9
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP4_1_3TCA_35kL	Stage 1 - BlackRW (for all permissable except toilets , car wash and air conditioning cooling). Rainwater to supply toilets, car washing and air conditioning cooling. 35kL tank	Average Rainfall	Total (ML/pa)	16.0	2.5	13.4	11.3	3.4	1.3	3.4	13.1	8.7	1.6	15.1	10.3	133.0
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	19.5	6.0	10.0	8.6	2.3	8.6	2.3	9.6	10.0	0.3	13.8	10.3	336.5
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.4	0.9	15.5	12.8	4.0	-2.5	4.0	15.1	7.9	2.4	18.2	10.3	43.1
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	5.8
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Job	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer (grey water not utiilised and black water)	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised Demand	Potable Substitution of Rain Water Tank	Potable Water Utilised	Flow to Grey Water Recycling Plant	Flow to Grey water Recycling not utilised (excess)	Black water only flow to sewer	Rainwater Tank Water Idealised Demand	Overflow to Stormwater
Southpipe	SP5_1_2TC_20kL	Stage 1- Grey Water Recycling (Scenario 5). Rainwater to supply toilet and car washing. Rainwater collected from 44mm and over only in a 20kL tank.	Average Rainfall	Total (ML/pa)	8.2	2.5	17.1	7.8	10.1	-8.6	10.1	13.1	1.0	5.6	26.5	9.3	1.5	6.7	6.6	4.5
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	2.7
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	14.3	6.0	10.0	5.3	5.3	0.1	5.3	9.6	2.5	4.1	20.6	10.7	5.4	8.9	6.6	64.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3	0.0	19.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	6.3	0.9	19.1	8.6	11.5	-11.1	11.5	15.1	0.2	6.4	29.7	9.0	0.4	5.9	6.6	0.0
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP5_1_2TC_30kL	Stage 1- Grey Water Recycling (Scenario 5). Rainwater to supply toilet and car washing. Rainwater collected from 44mm and over only in a 30kL tank.	Average Rainfall	Total (ML/pa)	8.2	2.5	17.1	7.8	10.1	-8.6	10.1	13.1	1.5	5.1	26.0	9.3	1.5	6.7	6.6	4.1
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	2.5
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	14.3	6.0	10.0	5.3	5.3	0.1	5.3	9.6	3.1	3.5	19.9	10.7	5.4	8.9	6.6	64.4
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3	0.0	18.8
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	6.3	0.9	19.1	8.6	11.5	-11.1	11.5	15.1	0.3	6.3	29.6	9.0	0.4	5.9	6.6	0.0
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP6_1_2TC_20kL	Stage 1- Grey Water Recycling (Scenario 6). Rainwater to supply toilet and car washing. Rainwater collected ina 20kL tank as required.	Average Rainfall	Total (ML/pa)	8.2	2.5	17.1	7.8	10.1	-8.6	10.1	13.1	5.4	1.2	22.1	9.3	1.5	6.7	6.6	136.4
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	14.3	6.0	10.0	5.3	5.3	0.1	5.3	9.6	6.4	0.2	16.7	10.7	5.4	8.9	6.6	339.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	6.3	0.9	19.1	8.6	11.5	-11.1	11.5	15.1	4.8	1.8	25.0	9.0	0.4	5.9	6.6	46.0
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	6.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP6_1_2TC_25kL	Stage 1- Grey Water Recycling (Scenario 6). Rainwater to supply toilet and car washing. Rainwater collected ina 25kL tank as required.	Average Rainfall	Total (ML/pa)	8.2	2.5	17.1	7.8	10.1	-8.6	10.1	13.1	5.9	0.7	21.6	9.3	1.5	6.7	6.6	135.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	14.3	6.0	10.0	5.3	5.3	0.1	5.3	9.6	6.5	0.1	16.6	10.7	5.4	8.9	6.6	339.8
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	6.3	0.9	19.1	8.6	11.5	-11.1	11.5	15.1	5.3	1.3	24.6	9.0	0.4	5.9	6.6	45.6
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	6.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP6_1_2TC_30kL	Stage 1- Grey Water Recycling (Scenario 6). Rainwater to supply toilet and car washing. Rainwater collected ina 30kL tank as required.	Average Rainfall	Total (ML/pa)	8.2	2.5	17.1	7.8	10.1	-8.6	10.1	13.1	6.3	0.3	21.2	9.3	1.5	6.7	6.6	135.4
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	14.3	6.0	10.0	5.3	5.3	0.1	5.3	9.6	6.6	0.0	16.5	10.7	5.4	8.9	6.6	339.8
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	6.3	0.9	19.1	8.6	11.5	-11.1	11.5	15.1	5.7	0.9	24.2	9.0	0.4	5.9	6.6	45.2
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	5.9
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southpipe	SP6_1_2TC_35kL	Stage 1- Grey Water Recycling (Scenario 6). Rainwater to supply toilet and car washing. Rainwater collected ina 35kL tank as required.	Average Rainfall	Total (ML/pa)	8.2	2.5	17.1	7.8	10.1	-8.6	10.1	13.1	6.5	0.1	21.0	9.3	1.5	6.7	6.6	135.2
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	14.3	6.0	10.0	5.3	5.3	0.1	5.3	9.6	6.6	0.0	16.4	10.7	5.4	8.9	6.6	339.7
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.3	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	6.3	0.9	19.1	8.6	11.5	-11.1	11.5	15.1	5.9	0.7	23.9	9.0	0.4	5.9	6.6	45.0
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
				Maximum (ML/day)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	5.8
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix H

Water Balance – Summary of Scenario 4 (25 kL and 30 kL Rainwater Tank) Staging Summary Output

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_1_2TC_25kL	Stage 1 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 25kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	16.0	2.5	17.1	12.2	6.2	-2.4	6.2	13.1	5.9	0.7	17.3	6.6	135.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	13.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	13.6	10.7	4.1	5.2	4.1	9.6	6.5	0.1	15.4	6.6	339.8
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.0	29.2
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	19.1	13.7	6.9	-5.8	6.9	15.1	5.3	1.3	20.1	6.6	45.6
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	6.0
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_2_2TC_25kL	Stage 2- BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 25kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	53.1	8.6	56.4	40.4	20.4	-7.8	20.4	43.1	19.4	2.4	57.0	21.8	448.4
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.2	0.1	1.2
				Maximum (ML/day)	0.9	0.8	0.2	0.2	0.1	0.8	0.1	0.1	0.1	0.1	0.2	0.1	43.3
				Minimum (ML/day)	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0	0.0	0.0	0.1	0.1	0.0
			Maximum Rainfall	Total (ML/pa)	66.4	20.5	44.9	35.2	13.5	17.7	13.5	31.7	21.4	0.4	50.7	21.8	1121.5
				Average (ML/day)	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	3.1
				Maximum (ML/day)	1.8	1.7	0.2	0.2	0.1	1.6	0.1	0.1	0.1	0.1	0.2	0.1	96.3
				Minimum (ML/day)	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
			Minimum Rainfall	Total (ML/pa)	49.1	3.2	63.1	45.1	22.9	-18.9	22.9	49.8	17.5	4.3	66.2	21.8	150.4
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.4
				Maximum (ML/day)	0.5	0.4	0.2	0.2	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.1	19.9
				Minimum (ML/day)	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_3_2TC_25kL	Stage3- BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 25kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	87.5	14.8	92.3	66.2	33.4	-12.0	33.4	70.6	31.7	4.0	93.0	35.7	733.8
				Average (ML/day)	0.2	0.0	0.3	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.3	0.1	2.0
				Maximum (ML/day)	1.5	1.3	0.3	0.3	0.1	1.4	0.1	0.2	0.1	0.1	0.4	0.1	70.8
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.1	0.0	0	0.0	0.0	0.1	0.1	0.0
			Maximum Rainfall	Total (ML/pa)	110.3	35.2	73.5	57.6	22.1	30.7	22.1	51.8	35.0	0.7	82.9	35.7	1835.1
				Average (ML/day)	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.1	5.0
				Maximum (ML/day)	3.1	2.9	0.3	0.3	0.1	2.8	0.1	0.2	0.1	0.1	0.4	0.1	157.5
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
			Minimum Rainfall	Total (ML/pa)	80.6	5.5	103.2	73.9	37.4	-30.7	37.4	81.5	28.7	7.0	108.2	35.7	246.1
				Average (ML/day)	0.2	0.0	0.3	0.2	0.1	-0.1	0.1	0.2	0.1	0.0	0.3	0.1	0.7
				Maximum (ML/day)	0.9	0.7	0.3	0.3	0.1	0.5	0.1	0.2	0.1	0.1	0.4	0.1	32.6
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_4_2TC_25kL	Stage4- BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 25kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	131.3	42.4	112.8	81.5	40.3	9.5	40.3	86.3	38.8	4.9	113.3	43.6	896.9
				Average (ML/day)	0.4	0.1	0.3	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.3	0.1	2.5
				Maximum (ML/day)	4.0	3.7	0.4	0.4	0.2	3.9	0.2	0.3	0.1	0.1	0.5	0.1	86.6
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.2	0.0	0	0.0	0.0	0.2	0.1	0.0
			Maximum Rainfall	Total (ML/pa)	192.7	100.9	89.8	71.1	26.4	95.2	26.4	63.3	42.8	0.9	100.7	43.6	2242.9
				Average (ML/day)	0.5	0.3	0.2	0.2	0.1	0.3	0.1	0.2	0.1	0.0	0.3	0.1	6.1
				Maximum (ML/day)	8.5	8.3	0.4	0.4	0.1	8.1	0.1	0.3	0.1	0.1	0.5	0.1	192.5
				Minimum (ML/day)	0.3	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0
			Minimum Rainfall	Total (ML/pa)	107.6	15.8	126.2	90.9	45.2	-28.5	45.2	99.7	35.1	8.6	131.8	43.6	300.8
				Average (ML/day)	0.3	0.0	0.3	0.2	0.1	-0.1	0.1	0.3	0.1	0.0	0.4	0.1	0.8
				Maximum (ML/day)	2.1	1.9	0.4	0.4	0.1	1.7	0.1	0.3	0.1	0.1	0.5	0.1	39.9
				Minimum (ML/day)	0.3	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_1_2TC_30kL	Stage 1 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 30kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	16.0	2.5	17.1	12.2	6.2	-2.4	6.2	13.1	0.3	6.6	135.4	6.3	16.9
				Average (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
				Maximum (ML/day)	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	13.1	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0
			Maximum Rainfall	Total (ML/pa)	20.0	6.0	13.6	10.7	4.1	5.2	4.1	9.6	0.0	6.6	339.8	6.6	15.3
				Average (ML/day)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
				Maximum (ML/day)	0.5	0.5	0.1	0.1	0.0	0.5	0.0	0.0	0.0	0.0	29.2	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Minimum Rainfall	Total (ML/pa)	14.9	0.9	19.1	13.7	6.9	-5.8	6.9	15.1	0.9	6.6	45.2	5.7	19.7
				Average (ML/day)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
				Maximum (ML/day)	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	5.9	0.0	0.1
				Minimum (ML/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_2_2TC_30kL	Stage 2 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 30kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	53.1	8.6	56.4	40.4	20.4	-7.8	20.4	43.1	20.7	1.1	55.4	21.8	446.9
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.2	0.1	1.2
				Maximum (ML/day)	0.9	0.8	0.2	0.2	0.1	0.8	0.1	0.1	0.1	0.1	0.2	0.1	43.3
				Minimum (ML/day)	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0	0.0	0.0	0.1	0.1	0.0
			Maximum Rainfall	Total (ML/pa)	66.4	20.5	44.9	35.2	13.5	17.7	13.5	31.7	21.7	0.1	50.4	21.8	1121.3
				Average (ML/day)	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	3.1
				Maximum (ML/day)	1.8	1.7	0.2	0.2	0.1	1.6	0.1	0.1	0.1	0.1	0.2	0.1	96.3
				Minimum (ML/day)	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
			Minimum Rainfall	Total (ML/pa)	49.1	3.2	63.1	45.1	22.9	-18.9	22.9	49.8	18.8	3.0	64.9	21.8	149.3
				Average (ML/day)	0.1	0.0	0.2	0.1	0.1	-0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.4
				Maximum (ML/day)	0.5	0.4	0.2	0.2	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.1	19.6
				Minimum (ML/day)	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_3_2TC_30kL	Stage 3 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 30kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	87.5	14.8	92.3	66.2	33.4	-12.0	33.4	70.6	33.9	1.8	90.8	35.7	731.4
				Average (ML/day)	0.2	0.0	0.3	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.2	0.1	2.0
				Maximum (ML/day)	1.5	1.3	0.3	0.3	0.1	1.4	0.1	0.2	0.1	0.1	0.4	0.1	70.8
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.1	0.0	0	0.0	0.0	0.1	0.1	0.0
			Maximum Rainfall	Total (ML/pa)	110.3	35.2	73.5	57.6	22.1	30.7	22.1	51.8	35.5	0.2	82.4	35.7	1834.9
				Average (ML/day)	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.1	5.0
				Maximum (ML/day)	3.1	2.9	0.3	0.3	0.1	2.8	0.1	0.2	0.1	0.1	0.4	0.1	157.5
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
			Minimum Rainfall	Total (ML/pa)	80.6	5.5	103.2	73.9	37.4	-30.7	37.4	81.5	30.8	5.0	106.2	35.7	244.3
				Average (ML/day)	0.2	0.0	0.3	0.2	0.1	-0.1	0.1	0.2	0.1	0.0	0.3	0.1	0.7
				Maximum (ML/day)	0.9	0.7	0.3	0.3	0.1	0.5	0.1	0.2	0.1	0.1	0.4	0.1	32.1
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0

JOB	Scenario Reference	Scenario	Rainfall Series		Flow to Sewer	Rainfall Infiltration	RW Idealised Demand	RW Actually Utilised	RW substituted by Potable Water	Surplus Recycled Water	Potable Substitution of RW	RW Watering	Rainwater Tank Water Utilised	Potable Substitution of Rain Water Tank	Potable Water Utilised	Rainwater Tank Water Ideal demand	Overflow from Rainwater Tank (Rainwater Not Utilised)
Southpipe	SP4_4_2TC_30kL	Stage 4 - BlackRW (for all permissable except toilets and car wash). Rainwater to supply toilets and car washing. 30kL tank for each dwelling, Collecting all rainwater - except the first flush.	Average Rainfall	Total (ML/pa)	131.3	42.4	112.8	81.5	40.3	9.5	40.3	86.3	41.4	2.2	110.6	43.6	893.9
				Average (ML/day)	0.4	0.1	0.3	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.3	0.1	2.4
				Maximum (ML/day)	4.0	3.7	0.4	0.4	0.2	3.9	0.2	0.3	0.1	0.1	0.5	0.1	86.6
				Minimum (ML/day)	0.2	0.0	0.1	0.1	0.0	-0.2	0.0	0	0.0	0.0	0.2	0.1	0.0
			Maximum Rainfall	Total (ML/pa)	192.7	100.9	89.8	71.1	26.4	95.2	26.4	63.3	43.4	0.2	100.0	43.6	2242.6
				Average (ML/day)	0.5	0.3	0.2	0.2	0.1	0.3	0.1	0.2	0.1	0.0	0.3	0.1	6.1
				Maximum (ML/day)	8.5	8.3	0.4	0.4	0.1	8.1	0.1	0.3	0.1	0.1	0.5	0.1	192.5
				Minimum (ML/day)	0.3	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0
			Minimum Rainfall	Total (ML/pa)	107.6	15.8	126.2	90.9	45.2	-28.5	45.2	99.7	37.6	6.1	129.2	43.6	298.6
				Average (ML/day)	0.3	0.0	0.3	0.2	0.1	-0.1	0.1	0.3	0.1	0.0	0.4	0.1	0.8
				Maximum (ML/day)	2.1	1.9	0.4	0.4	0.1	1.7	0.1	0.3	0.1	0.1	0.5	0.1	39.2
				Minimum (ML/day)	0.3	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0

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